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EDITORIAL NOTES.

Flexibility in Gas Manufacture.

A PROPER tendency of the times is the securing of a greater flexibility in the production of gas. The need for this is being intensified year by year by the particular line of development which the gas industry is making. This is in the utilization of gas for heating purposes, and for this no uniform consistency in demand can be relied upon. Requirements in this respect will always be—particularly for domestic heating—subject to outside influences over which the gas manufacturer has no control. Owing to the large extension there has been in the adoption of gas fires for domestic heating, flights in winter demand, with the sudden falls in atmospherical temperature, are made which at one time were never dreamed of by those responsible for meeting the gas needs of their districts. This was especially emphasized during last winter; and the greater the connection of domestic fires, the larger will be the variations between normal and peak demands. This is unavoidable; it is incidental to our advance in destined service. It is therefore the business of gas engineers to make preparation betimes to meet a condition which we think—know, we almost might say—to be inevitable.

A contribution to providing for this in respect of the production of gas is made in the specification of a patent which we publish this week, and which bears the names of Messrs. Humphreys & Glasgow and Mr. J. A. Perry. The invention is not one of a fundamental nature; but it is rather a blend of known systems of gas production, upon which changes can be rung, so as promptly to provide any amount of gas according to demand, without disturbing even curves in respect of calorific value and specific gravity—thus, with a change, avoiding any need for the readjustment of consumers' appliances. Hitherto, any considerable flexibility at the manufacturing end has claimed governing points on all consumers' appliances—countless governing points in a district, while the manufacture is in most cases at one point only. And it is well known that the governing at consumers' appliances is not so consistently performed as is desirable for the realization of the highest efficiency. It may be said that this is the fault of the consumers, and not of the gas producers. At the same time, it is to the interest—in fact, it is a duty—of gas manufacturers to do everything possible to reduce the much neglected obligation on the part of consumers to do something which will give them the best possible result from the gas. It is true that in normal times most gas manufacturers are able to keep their gas constant both in calorific value and specific gravity; but, as already pointed out, the need for a greater flexibility at the manufacturing end is being increasingly felt year by year.

Therefore, the object Messrs. Humphreys & Glasgow and Mr. Perry have had in view has been to secure a large flexibility at the gas-producing end, and there to so govern the conditions as to make unnecessary any readjustment of the consumers' appliances. They propose the provision of gases of commercial manufacture, of which some may be supplied at periods of light or normal load, and of which admixtures may be readily and economically made at periods of heavy load, without calling for any attention on the part of the consumers in regulating their appliances. The proposal is that the normal supply shall be a coal and a producer gas, which the inventors call the "base gas." The properties of this when mixed in the right proportions will be, as regards calorific value and specific gravity, substantially the same as those of water gas or carburetted water gas, which is named by the inventors the "peak gas." The properties of the gases in respect of calorific value and specific gravity being alike, the peak gas can be used for increasing the supply at any time, and to any extent that demand or emergency necessitates, without claiming the adjustment of the consumers' appliances. In this way, it is claimed, the greatest flexibility in manufacture can be obtained. The invention is not limited to any particular heating value standard; but it follows that the lower (within practicable limits) the calorific standard is, the larger the percentage of variation there may be in the admixture of the base and the peak gases. In the article, prepared from the specification, in later columns will be found data illustrating the practice of the invention; and it will there be also seen how the calorific value and specific gravity of the combined gases are regulated by admixture in the correct proportions. The producer gas is obviously the one which plays an important part in realizing the balance between the base gas, in respect of calorific value and specific gravity, and the peak water gas or carburetted water gas, as the case may be.

It is a highly interesting suggestion, in view of the inconstancy of demand which is becoming more and more severe by the course of development in gas utilization. The proposal will no doubt be carefully examined by the technical men of the gas industry as a contribution to the schemes for meeting the new gas-demand characteristics.

Minimum Sliding-Scale Dividend.

THE introduction of a minimum dividend into the sliding-scale may now be taken to have received the complete ratification of Parliament. Apart from the pioneer work of the South Metropolitan Gas Company in creating the basic price and dividend system (which has been adopted by certain other gas companies), and the recent incorporation of minimum dividends in the sliding-scales applying to the Metropolitan Electricity Supply Companies, we have now the success of the Gas Light and Coke Company in convincing first the House of Commons and last week the House of Lords that it is a good thing for the financial stability of gas companies that a minimum dividend should be incorporated in the sliding-scale. No one with any intelligence would seriously contend, after the experience of wartime and subsequently, that an open door at the lower end of the sliding-scale is a proper condition in the interests of the industry and those it serves. The precedents for the change were no doubt useful to the Gas Light and Coke Company; but this Company now supplies the first precedent for not interfering in any way with the sliding-scale, other than by the introduction of a protecting point of 5 p.ct. for the holders of ordinary capital, while permitting fixed increases of dividends being paid (when profits allow) as reductions of the price of gas are made below the standard figure. This precedent is highly valuable to gas companies generally, inasmuch as the Company's present ordinary capital represents close upon 22 p.ct. of the total share and stock capital of statutory

company undertakings (omitting all loan capital and debenture stock and local authority gas loans) as existing in 1924—the year dealt with in the last issued Board of Trade returns. The House of Lords Committee, as will be seen by the report in later columns, allowed the Company's Bill to proceed, subject to the insertion of a proviso that it should be within the power of local authorities in the area of supply at the expiration of five years, and of subsequent periods of five years, to apply to the Board of Trade to reduce the minimum dividend, or do away with it altogether—any Order in this regard to be subject to the approval of Parliament in the same way that Special Orders have to be approved to-day. The Board of Trade would then be able to review the whole of the circumstances. If there is no application, then the scheme will remain as set out in the Bill. The Company were able to accept the proviso with complete confidence. The soundness of the principle of a minimum dividend has already been established by experience; and accruing experience will confirm it. We anticipate that many gas companies now operating under the sliding-scale will apply, as opportunity permits, for the incorporation in it of a minimum dividend.

Co-Operative Coal Sales.

AMONG the problems of a more or less polemical nature which are now under consideration is that of co-operative coal selling. It is a subject which Sir Alfred Mond, Bart., M.P., has been strongly advocating in the Press and from public platforms during the last two or three months. The idea emanated from the Coal Selling Syndicates of Germany; and Sir Alfred is of opinion that great advantage would be derived in this country from pursuing a similar policy. We dealt with his views in an editorial article in the "JOURNAL" on the occasion of the delivery of his Presidential Address to the Society of British Gas Industries (see "JOURNAL" for July 7, p. 20). Since then a paragraph has appeared (*ante* p. 76) which showed that certain South Yorkshire colliery interests have under consideration the matter of forming a gas coal selling combination. Now we see that the Government have appointed a Committee to inquire into, and report upon, the desirability and practicability of developing co-operative selling in the coal industry, and to make recommendations. The composition of the Committee is as follows: Sir Frederick William Lewis, Bart. (Chairman), Mr. John R. D. Bell, Sir Thomas S. Catto, Bart., the Right Hon. Vernon Hartshorn, M.P., Sir Hugo Hirst, Bart., Sir David R. Llewellyn, Bart., Mr. A. K. McCosh, the Right Hon. Sir Alfred Mond, Bart., M.P., Sir W. Harry Peat, K.B.E., Mr. Frank B. Varley, M.P., and Mr. J. A. Warriner. It will be observed that (excepting Sir Alfred Mond, who is well-known to be in favour of the institution of such selling combinations in this country) the gas industry, though a large buyer of coal, is not directly represented; and it may be that, though he has connections with the industry, the opinion of Sir Alfred would not in all details coincide with those of its leaders. On the other hand, it will be noted that Sir Hugo Hirst, Bart., is a member of the Committee. Of Sir Hugo's commercial ability there is not the slightest question; but through his interests he may be taken to be a representative of the smaller coal-consuming electricity industry, although he is not directly engaged in the work of supplying electrical energy, but in that of providing plant for its generation and appliances for its utilization. It seems somewhat strange that such a considerable coal-consuming industry as that of gas supply should not be represented upon a Committee of this kind, so that it could have a voice in the private discussions of the Committee before they make recommendations. If coal-selling combinations are formed, there will have to be suitable safeguards; and upon the nature of these the large consumers should be consulted before attempting anything definite. In the House of Commons on Friday night, a proposal was made, on behalf of the Labour Party, by Mr. Lawson that local authorities should have power to sell coal. The Labour Party are always looking out for new contributions to the paving of the way to nationalization. The proposal was not accepted. Speaking for the Government, Sir L. Worthington Evans stated that the Committee the Government had set up had had the duty assigned to them of ascertaining how best to get the coal from the pit into the hands of the consumer. In view of this, the intention is to await the report of the Committee before deciding whether or not municipal selling shall be authorized.

An Eleventh-Hour Struggle.

THE Executive of the Miners' Federation have been making an eleventh-hour struggle to save, in the eyes of their constituents, some personal credit to themselves out of the tragedy of their insane mismanagement of the miners' affairs. They thought they saw a loophole in the intervention of the churches, through the Industrial Christian Fellowship. But this failing, as it was bound to do under the suggested conditions, Mr. Smith, Mr. Richards, Mr. Richardson, and Mr. Cook left the men who sought a peaceful solution, and made another jaunt to the Continent to see whether they could not prevail upon the European miners to add to the mischief which the Miners' Executive have already achieved in their native land. Some idea of what this mischief means financially to the country was given by Mr. Runciman, in a highly interesting speech in the House of Commons last Wednesday. From the figures available, he calculates that, including the loss so far incurred of about £25,000,000 in miners' wages, the country has already through the coal strike lost in round figures £148,000,000. But this is not the end of the tale. Data from other industries are not procurable, and the strike is still on, so that the full measure of the country's loss is not ascertainable. Beyond the figure already quoted, there is the subsidy which the nation has paid; and there is the loss of contracts for coal, other material, and plant, which will mean a continued lowering of this country's trade for some time to come. All this is a terrible sacrifice, due to the blundering of a few incompetents, who set a slogan before economic facts, and who refused to see that, if a business cannot be made to pay under certain conditions, there must be a revision of those conditions, or the alternative of bankruptcy must be faced. It is clear that the Miners' Federation is an organization which is, under the direction of those who have controlled its policy during the past few years, a big menace to the interests of the country. We have been reminded during the last few days by Sir Robert Horne that in 1921, when there was a similar stoppage of work in the coal-fields (which continued for over thirteen weeks), the loss to the country was estimated at £355,000,000.

The result of the excursion of the leaders of the Miners' Federation to Paris to confer with the International Miners' Federation has not transpired, other than in general terms. But had it not been disappointing, there would have been shouting from the housetops in order to hearten the men. It is known that it was again urged upon the Continental miners' leaders that they should do something to stop not only the export of coal to this country, but the occupation by their countries of the foreign markets which were formerly supplied by British coals. The latter request is rather a belated one; and Messrs. Smith and Cook apparently see their own folly in not before appreciating that the loss of business which their strike action would bring about would develop unemployment among British miners. Furthermore, they find that some industries in this country are carrying on without a pause—true at considerable expense; that the railways have returned to their full services; and that some works which were closed for want of fuel are re-opening—due mainly to the fairly large inflow of foreign coal. These facts are unpleasant for them; and they cannot be hid from the miners. Experience during the 1921 strike has facilitated greatly on this occasion the transport of coal not only from the Continent, but America, and the Miners' Federation are absolutely impotent to stop it. The representatives of other countries in the International Miners' Federation now know what the Council of the Trade Union Congress think of the British miners' leaders; and they are also aware that it would be futile on their part to attempt to stop coal supplies to this country while the railway and transport men here are unwilling to deprive

their own men of work through the folly of Smith, Cook, & Co. The British miners must feel that they have been gulled by their own leaders and by the miners' leaders in other countries, who made promises which they knew full well they were incapable of fulfilling. The latter cannot rule the industry which gives employment to their members; and they are not inclined to order them to cease work, on the invitation of the British Miners' Federation, in order to strip the coal owners of their own countries of the ability to do business which provides work for their men, and in greater numbers. As a matter of fact, this strike has been a boon to them in a time of industrial depression; and no doubt they would like it to continue. There is no question that the psychology of the miners abroad is somewhat different from that of the leaders of the British Miners' Federation. However, not one of the flying visits to the Continent of Smith, Cook, and others has done an atom of good to the miners of this country. They realize at last that their own crass ineptitude has been of considerable benefit to the miners abroad. In the first seventeen days of July, no less than 1,345,000 tons of coal were landed in this country from the pits of other countries. That fact speaks volumes.

One other point about the International Conference is that Mr. Frank Hodges gave some interesting information as to the assistance from other bodies which has been received during the stoppage by the British miners. He said that the contribution from Russia amounted to £76,000; from the British Women's Movement, £87,000; from the "T.U.C.," £30,000; from the Weavers' Unions, £15,000; from the International Miners' Federation £21,000. These are evidently the most striking items he could advance; but they do not, of course, constitute all that has been received by way of smaller sums. The named prominent contributions total £229,000. But what is that among so many? A million or more miners have now been on strike for close upon three months; and the £229,000 would therefore represent less than a single payment of 5s. apiece. Big strikes involving so many men are expensive means of endeavouring to realize an end—particularly an impossible end; and all that money has been expended, and the millions to which Mr. Runciman referred have been lost, and no good has resulted.

In the first part of the week, the leaders of the Miners' Federation—no doubt hoping that a channel had been provided through which they could escape from the *cul-de-sac* in which they find themselves—were willing to adopt the scheme which came from the Industrial Christian Fellowship, headed by the Bishops, to whom the Prime Minister accorded an interview on Monday. Then, as before, he was firm against any further expenditure of public money on subsidies for the coal industry. Another subsidy and re-opening of negotiations would simply mean travelling again over the old ground, and nothing is to be gained by that. We know all there is to be known; and it points definitely to the way of settlement. By their intervention, we are afraid the churches—though their intentions were of the best—did more harm than good, by assisting to prolong the strike, through raising hope in the men's minds that something to their advantage would turn up as a result of their action. This appears pretty clear from the fact that (since it has been known that the proposals could not be accepted) there have been signs in the coal-fields that more men are disposed to return to work under the eight-hour scheme. It is estimated that there were in Warwickshire and Staffordshire alone some 13,000 to 14,000 men back at work last Friday, and it was computed that some 20,000 men altogether were engaged in the production of coal. In other areas, the men have been getting uneasy over the weighty evidence that, after all they have done in compliance with foolish orders, political ambitions contain nothing of material value for them. While their leaders are still making an eleventh-hour effort to do something to save their own faces, many miners in the different districts are looking at the matter from a practical point of view, and are using their best efforts to get a return to work of those who are still hanging back in the hope that some miracle will happen to produce justification for their leaders' attitude and their own in supporting, by inactivity, a policy devised by craft or imbecility. During the week-end, the leaders have been doing all they can, by trips through the districts and haranguing the men, to prevent an extension of the burst that has taken place in the ranks of the strikers. That is only an endeavour to defer the inevitable end.

A Good Character.

THE gas industry has never suffered from superfluous adulation or recognition in the public Press, notwithstanding the important services it has rendered, both in war and peace, to the country in many directions. Therefore, all the more welcome is an editorial article in a recent issue of the "Daily Telegraph," in which the writer showed good knowledge and appreciation of the work of the industry, and of the large advances it has made in the economical use of our chief asset—coal. The fashion of late has been to talk largely and loosely in the newspapers of the wonders of electricity, not so much in respect of its production, but of its performances, some of which will not bear looking into narrowly and comparatively with more economical heating and cooking agents. Service in relation to cost is what has to be considered, and that is not the only thing. The sum-total of service from every ton of coal is a matter of national importance; and if the editors of newspapers can be persuaded to give more attention to that aspect of the matter, instead of confining themselves to whatever for the time being is made (by political influence or in other ways) a topical subject, they will find in the study a vast amount of interest for the public, and education for themselves. Maybe, too, they will be led into a comparison of processes to ascertain which gives the best and most profitable yield from the coal used.

It is opportune, in view of the advertisement that the Prime Minister, other members of the Government, and Parliament generally have given to electricity, that the true position of the operations of the gas industry in the national economy should be widely known. In both its editorial and engineering columns, the "Daily Telegraph" has always endeavoured to be fair to the gas industry. In the article before us, it presents its readers with an account of the industry's doings, which show that it is entitled to a good character. This is done in a manner which can leave no doubt in the minds of readers that, in the matter of the scientific treatment of coal, and the separation from it, for the good of mankind, of its simple and complex properties, the industry stands unrivalled. In the view of our morning contemporary, the development of the industry has been natural and well ordered. That is true. There are often claims that the sole spur to higher standards in the economy and efficiency of the industry has been the competition of electricity. A greater mistake was never made; we have over and over again had to correct it. To admit that it was right would be to deny the existence of initiative and inventive ability among the technical men in the gas-supply industry, and in that section devoted to the design and erection of plant and the provision of appliances. The development of the industry as a whole has always depended upon the elevating of economy and efficiency in both the production and the utilization of gas.

Another incentive which came into being before the first General Electric Lighting Act was passed was (as the "Daily Telegraph" points out) when Parliament agreed that in the company part of the industry the return on the capital invested should bear a definite ratio to the cheapness of the gas supply. The sliding-scale of price and dividend stimulated efficiency, because it encourages the producers of gas. It induces them to do all in their power to supply cheap gas of standard quality, in order to become entitled to higher dividends. We have seen suggestions that this must tend to encourage neglect of plant—neglect of its proper maintenance and of the application of new types and processes. This would be short-sighted policy. Neglecting plant and clinging to the obsolete would mean that there would be no progress in efficiency; and, therefore, no economy and no cheaper production, other than that which could be secured by the reduction of the price of raw materials, and the improvement of the market values of secondary products. Our

morning contemporary does not fall into this error of accusing us of neglect. On the contrary, it says that the sliding-scale "led all who were concerned with gas production to devote increasing attention to research in the effort to earn greater profits, with the result that there is no industry in this country which owes its prosperity in larger measure to the triumphs achieved in the laboratory. Gas production is to-day possibly the most highly organized, and most economically, as well as scientifically, conducted industry in this country." And again: "The "gas maker is of all manufacturers perhaps the most "thrifty; everything in a ton of coal is turned to good "account." Some of the products are the raw materials of other industries, whose manufactures are of universal application throughout the community. Some of the electrical enthusiasts who have prophesied that the gas industry would simply succumb before electricity have not paused to ask why electricity is incompetent in the domestic and industrial realms to offer the same economy and efficiency that gas can do through the multiplex applications of its various commodities. They have not stopped to inquire how the industry of the country would fare if deprived of the products which are in bond in coal, and can only be set free by the process of carbonization. Those same electrical prophets pay no heed to the obvious fact that neither themselves nor their kith and kin could enjoy life to the same extent that they now do without the products placed at their disposal by the gas industry.

It is further suggested by the electrical enthusiasts that they see no reason why, for the production of these necessaries of daily life, they should not themselves carbonize coal and utilize some of the resulting fuel in the production of electricity. We suggest that the more simple plan would be—a union should have been made nearly half-a-century ago—for electricity to become a secondary product of the gas industry, by the utilization in its generation of the fuel and waste heat that is produced. The fundamental work is the treatment of coal, not the generation of electricity; the utilization of the gas and the coke—whether for direct utilitarian purposes, or for the indirect one of generating electricity—is secondary.

Anyway, we can dismiss the puerilities of those who would change the ways of life by the destruction of essentials, and so take a retrograde step, instead of promoting advancement; and we can also be thankful that the gas industry is now getting more acknowledgment of its work than has hitherto been the case. When its position is portrayed with such faithfulness as is done by the "Daily Telegraph," it is an encouragement. The industry truly appreciates the recognition that it has tried to win a good character, and that its efforts have succeeded.

Coal Stoppage and Applications for Amending Orders.

Special rules have been issued by the Board of Trade regarding applications for amending Orders under section 1 (3) of the Gas Regulation Act, 1920, consequent on the increased cost of coal due to the stoppage. The rules are given *in extenso* on a subsequent page.

Coal from Abroad.

In the House of Commons last Wednesday, Colonel Lane-Fox, Secretary for Mines, stated that between July 1 and 17, 1,345,000 tons of foreign coal arrived in British ports. This does not include the quantity received in Northern Ireland. A good rate of delivery is being maintained, judging from figures received at the end of last week, which, however, do not reflect totals, but only certain ports.

A Competition.

The Organizing Committee of the Public Works, Roads, and Transport Congress Exhibition are offering three prizes for papers, which are to be submitted for discussion at the Congress to be held in November, 1927. Particulars are given in a later column.

Sulphate Plant Effluent.

It will be remembered that the Central Executive Board of the National Gas Council remitted to the Institution of Gas Engineers the investigation of the important matter of gas-works effluent. To report upon it, the Institution have appointed a Committee, consisting of Prof. Smithells, Prof. Cobb, Mr. C. F. Botley (President of the Institution), and Mr. W. E. Price. Their preliminary work will be to collate all available facts, with a view to presenting a report, and making a start on the experimental part of the work. The services of Dr. Parker and Dr. Monkhouse, of the Leeds University, are to be utilized in this connection—the latter to exercise constant supervision. Dr. T. Lewis Bailey has also promised his assistance; and the British Sulphate of Ammonia Federation have voted 100 guineas towards the research.

Smoke Abatement Bill.

Industrialists are still much agitated over the Smoke Abatement Bill. They consider that it will mean a severe tax on some of the country's manufactures. Last week, a deputation waited upon Sir H. Kingsley Wood, Parliamentary Secretary to the Ministry of Health, and placed their views before him. It was stated that several letters, protesting against increasing the burden upon manufacturers in respect of smoke, had also been received from leading manufacturers in the Potteries, the Black Country, and Sheffield. Sir Kingsley Wood stated that the Ministry of Health have no desire to impose any undue burden on industry, which, it is recognized, is sufficiently oppressed already. He promised that, before the Bill is considered by a Standing Committee (which will not be until after the Summer recess), the points submitted by the manufacturers will be carefully considered; but he warned his visitors that there will be no interference with the main principles of the Bill. The National Gas Council are alive to the necessity of introducing amendments dealing with the domestic smoke nuisance. It is acknowledged on all hands that domestic smoke is a great sinner in respect of air pollution. The action of the National Gas Council is not wholly a matter of self-interest in respect of the development of the sales of gas and coke; whatever movement in this respect they make, and whatever success they gain, will be in the interests of the country at large. It is recognized that the pollution of the air would be much worse than it is, were it not for the millions of gas cookers and fires now in use; but the 38 million tons of raw fuel still used for household purposes constitute an enemy which ought not to be left alone by the Government on purely sentimental grounds.

A General Strike Sequel.

The ex-Prime Minister and certain other men of the Labour-Socialist Party have characterized as moonshine the legal pronouncements of Sir John Simon and Mr. Justice Astbury regarding liability for the calling of strikes and for leaving employment without giving due notice, and so breaking contracts. What authority Labour politicians and leaders have for setting their opinion against such eminent legal authorities, we have not the faintest notion, nor probably have they themselves. But this we do know, that those who were responsible for the calling of the General Strike are devoutly thankful that they have not suffered the penalty to which they so foolishly exposed themselves. Those branch secretaries of the National Sailors' and Firemen's Union who defied their own Executive, and called out the men at their branches, were deeply repentant when brought before Mr. Justice Astbury, and humbly sought his guidance. Their dismissal from further service in the Union has caused them to plead for reinstatement (which has been refused by Mr. J. Havelock Wilson), while their dupes—for whom we have greater sympathy—are seeking new employment, and cannot get it, with so many men ready to step into the vacancies which their own folly created. Last Friday, Mr. Justice Tomlin had three Unions before him, at the instance of the Bradford Dyers' Association, in respect of a breach of contract due to the General Strike. The Association did not wish to do anything which would appear vindictive; and therefore they agreed to an order for the payment of purely nominal sums by way of damages. The Amalgamated Society of Dyers have to pay £100, and the National Union of Textile Workers and the National Union of General and Municipal Workers, £10 each, with the whole costs of the action. The sums paid can well be described as "nominal," inasmuch as, according to Mr. Gavin Simonds, K.C., "the damage which

has resulted from the breach is beyond all calculation." The Unions were no doubt glad to get off so lightly, despite Mr. Macdonald's profound view that Sir John Simon and Mr. Justice Astbury have been guilty of making pronouncements which were pure nonsense.

Conspiracy and the Emergency Regulations.

In the editorial article on the "Eleventh-Hour Struggle," allusion is made to the trip of certain members of the Executive of the Miners' Federation to Paris to try to prevent the transmission of coal supplies to this country. Legal experts are considering whether those leaders are not guilty of an offence under the Emergency Regulations. One of them provides that, "if any person attempts or does any act calculated or likely . . . to impede, delay, or restrict the supply or distribution of food, water, fuel, light, or other necessities, he shall be guilty of an offence against these regulations, provided that a person shall not be guilty of an offence under these regulations by reason only of his taking part in a strike, or peacefully persuading any other person to take part in a strike." It is submitted that it is questionable whether the concluding words can be held to indemnify the miners' leaders, since they are conspiring with foreign labour representatives who are not, and cannot be, parties to a strike in Great Britain.

Fuel Oil.

"It's an ill wind that blows nobody good." Like the dealers in foreign coal, the oil people are reaping good business from the stoppage in the coal industry. Numerous works have adopted fuel oil, including electricity stations and the railways. What with imported coal and fuel oil from abroad and from the refineries in this country, we are not doing so badly as those patriots, Messrs. Smith and Cook, so earnestly desire.

Coal Exports.

The Board of Trade returns for June are not altogether barren of data referring to coal. The small quantity of 34,485 tons, with a value attached of £37,818, represented the whole of our overseas business in this line. Of the total no less than 24,842 tons were steam coal, and 7705 tons anthracite, so that the balance of other classes is of an infinitesimal order. In June, 1925, 3,733,845 tons were exported, having a value of £3,768,521. In June, 1924, the total amount shipped was 4,882,291 tons, having a value of £5,728,045. During last month no gas coal was sent abroad. In the six months of the year, the total business in coal abroad was 18,964,289 tons, of a value of £17,229,206. In the first half of 1925, the shipments were 25,848,443 tons, of a value of £26,912,336. In the first half of 1924, the corresponding figures were 31,131,057 tons, and £38,002,992. The gas coal exported in the six months was 2,491,787 tons, of a value of £2,032,988, which gives an average per ton of 16s. 3·8d. In the first half of 1925, the gas coal shipments amounted to 3,422,795 tons, of a value of £3,389,518; and in the same period of 1924, the shipments were 4,211,932 tons, of a value of £5,032,570.

Gas Coke Business Abroad.

Notwithstanding the ruling conditions, the month of June was not altogether denied export business in gas coke; but the total was only 2091 tons, for which the value of £2213 is given. This averages £1 1s. 2d. per ton. In June, 1925, the quantity exported was 15,840 tons of a value of £14,529; and in the same month of 1924, the figures were 34,625 tons and £61,662. In the half-year, the business in gas coke reached 369,318 tons, the value of which is given as £381,033. The corresponding figures for the first half of 1925 are 224,814 tons, and the value £318,466; in 1924, 442,717 tons, and £776,735.

Tar Products.

Generally speaking, business abroad in tar products appears to be on the upward grade. Last month very little was done in benzole and toluole; but in the six months 418,535 gallons were exported, as compared with 137,884 gallons in the first half of 1925. Of naphtha in the same period 53,177 gallons were shipped, as against 25,541 gallons. Of tar, oil, creosote, &c., 6,902,246 gallons were exported in June, as compared with 2,687,822 gallons in June, 1925. In the six months the total shipments were 26,875,943 gallons, as against 20,849,689 gallons in the first half of 1925.

Sulphate of Ammonia Shrinkage.

The reduction of the overseas business in sulphate of ammonia is further illustrated by the June returns. In that month the total shipments were 12,270 tons, compared with 19,575 tons in June, 1925. In the six months the exports amounted to 103,083 tons, compared with 134,039 tons in the first half of 1925—a reduction of no less than 23·1 p.ct. During the half-year, France has entirely dropped out as a purchaser of British bye-product sulphate of ammonia. Spain and the Canaries have not been such good customers—their purchases amounting only to 24,064 tons in the six months, compared with 62,641 tons in the first half of 1925. The Dutch East Indies have slightly increased their patronage—their buyings having been 17,214 tons, as compared with 15,334 tons in the corresponding period of 1925. Japan has also been a better customer with 27,973 tons, as against 18,580 tons in the June half of last year.

Gas Oil Imports.

Judging by the imports of gas oil, there has been a stronger demand for it, and for well-known reasons. The total quantity received last month was 8,438,917 gallons, which compares with 6,503,895 gallons in June, 1925. In the half-year, 35,151,386 gallons were imported, as against 32,828,162 gallons in the first half of 1925.

PERSONAL.

Mr. DAVID STRUTH and Mr. JAMES MACKIE have been appointed Directors of the Cupar Gas Company.

Mr. F. G. AMBLER, who was formerly with Messrs. Goodall, Clayton, & Co., Ltd., of Leeds, has joined the firm of Messrs. E. Cockey & Sons, Ltd., of Frome, as their technical representative.

FORTHCOMING ENGAGEMENTS.

July 29.—"B.C.G.A." EXECUTIVE AND GENERAL COMMITTEES.—Meeting at No. 28, Grosvenor Gardens, S.W. 1.
Aug. 4-5.—ASSOCIATION OF STATUTORY INSPECTORS OF GAS METERS.—Annual general meeting at Glasgow.
Aug. 17-18.—IRISH ASSOCIATION OF GAS MANAGERS.—Annual meeting in Dublin.
Sept. 2.—NORTH BRITISH ASSOCIATION OF GAS MANAGERS.—Annual meeting at Glasgow.
Sept. 6-18.—SMOKE ABATEMENT EXHIBITION, at Birmingham.
Sept. 9.—"B.C.G.A."—Midland conference postponed until spring, 1927.
Sept. 11.—GAS SALESMEN.—Annual meeting at Birmingham.
Sept. 14.—NATIONAL GAS COUNCIL.—Meeting.
Sept. 14.—FEDERATION OF GAS EMPLOYERS.—Meeting.
Sept. 14-16.—INSTITUTION OF PUBLIC LIGHTING ENGINEERS.—Conference at Newcastle.
Sept. 16.—MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—Official visit to the Smoke Abatement Exhibition, Birmingham.
Sept. 20.—EVENING STAR LODGE.—Emergency Meeting.
Oct. 25-27.—"B.C.G.A."—Annual conference at Newcastle.

INSTITUTION OF GAS ENGINEERS.

Sept. 13.—Emergency and Finance Committees.
Sept. 14.—Advisory Committee on Education.
Sept. 20.—Council meeting.
Sept. 21-23.—Postponed Annual Meeting.
Sept. 24.—Visit to Hastings.

Society of British Gas Industries.—From the Secretary (Mr. Arthur L. Griffith) we have received a copy of the rules of the Society and list of members brought up to date.

Midland Association of Gas Engineers and Managers.—There will be an official visit of the Association to the Smoke Abatement Exhibition, Bingley Hall, Birmingham, on Thursday, Sept. 16, on which date a lecture is to be delivered by Sir Arthur Duckham.

Dividend of the Gas Light and Coke Company.—We are informed by the Secretary (Mr. W. L. Galbraith) that the Directors of the Gas Light and Coke Company have declared dividends for the half-year ended June 30 as follows: On the 4 p.ct. consolidated preference stock, at the rate of £4 p.ct. per annum; on the 3½ p.ct. maximum stock, at the rate of £3 10s. p.ct. per annum; and on the ordinary stock, at the rate of £5 1s. 4d. p.ct. per annum.

GAS (AMENDING ORDERS) RULES, 1926.

Made by the Board of Trade with respect to Applications for Amending Orders under Section 1 (3) of the Gas Regulation Act, 1920, consequent on the increased cost of coal due to the stoppage in the coal industry.

1.—The Gas (Amending Orders) Rules, 1923 (S.R. & O., 1923, No. 439) shall not apply to applications for Amending Orders revising the powers of charging authorized by an Order made under section 1 of the Gas Regulation Act, 1920, where the application is based upon the increased cost of coal due to the stoppage in the coal industry.

2.—An application for such an Amending Order may be made to the Board of Trade by the undertakers by letter addressed to the Director of Gas Administration, Board of Trade, Great George Street, London, S.W. 1.

3.—The application shall state the standard or maximum price per therm which the undertakers applying for the Order propose shall be substituted for the existing standard or maximum price authorized.

4.—The application shall be accompanied by the following documents:

(*a*) A statement in duplicate setting out all matters relevant to the application, including details of the alterations in the costs of the production and supply of gas by the undertakers consequent on the increased cost of coal after making due allowance for increased prices for coke;

(*b*) Proof of the service and publication of the notice required by Rule 5, together with a list of the authorities on which the notice has been served.

5.—Any undertakers applying for an Amending Order shall serve upon the local authority, and publish in the London or Edinburgh "Gazette," as the case may be, and in at least one newspaper circulating within the limits of supply of the undertakers, a notice of the application stating—

(*a*) the standard or maximum price per therm which the undertakers propose shall be substituted for the existing standard or maximum price authorized and the period for which it shall be so substituted;

(*b*) that a copy of the application and of all the documents submitted to the Board of Trade therewith may be inspected, free of charge, at the office of the undertakers within their limits of supply during office hours; and

(*c*) that representations with regard to the application may be made in writing to the Board of Trade within 10 days of the service or publication of the said notice (whichever be the later), and that a copy of such representations must at the same time be forwarded to the undertakers.

6.—After expiry of the period referred to in Rule 5, the undertakers shall furnish to the Board of Trade their observations on any representations which have been made, and shall transmit a copy thereof to the party making the representations.

7.—The fee payable in connection with an application for an Amending Order under these Rules shall be in accordance with the scale specified in the Schedule hereto, and a cheque for the appropriate amount, made payable to the Assistant Secretary for Finance, Board of Trade, shall accompany the application.

In addition, any extraordinary expenses incurred by the Board of Trade in connection with any inquiry into the application or otherwise, will be payable by the undertakers.

8.—These Rules may be cited as the Gas (Amending Orders) Rules, 1926.

Dated this 23rd day of July, 1926.

(Signed) H. A. PAYNE,
A Secretary to the Board of Trade.

SCHEDULE.

Scale of Fees.

Where the undertakers in respect of whom it is proposed that an Amending Order shall be made supplied during the last complete year ended Dec. 31:

	£
Up to 500,000 therms	5
500,000 therms and less than 2,500,000 therms	10
2,500,000 therms and over	15

Civil Pensions.—The list for the year ended March 31, 1926, under the Civil List Act, 1910, includes £125 to Mrs. Marian Dibdin, in recognition of the scientific work of her husband, the late Mr. William Joseph Dibdin, F.I.C., F.C.S.

Safety in Mines Research Board.—The fourth annual report of the Safety in Mines Research Board, in respect of the year 1925, has just been published (H.M. Stationery Office, price 1s. net). The report is mainly devoted to brief accounts of the progress of the numerous researches which are being carried out directly under the Board, or under Committees of the Board, or at universities and other centres with the aid of funds supplied by the Board. The Board have now two experimental stations, one at Sheffield for laboratory work, and one at Buxton (formerly at Eskmeals) chiefly for large-scale work.

SELLING OF COAL.

A Committee of Inquiry.

The Secretary for Mines announces that the following gentlemen have been appointed to serve on the Committee which has been set up to inquire into and report upon the desirability and practicability of developing co-operative selling in the coal-mining industry, and to make recommendations:

Sir Frederick William Lewis, Bt. (Chairman).
Mr. John R. D. Bell.
Sir Thomas S. Catto, Bt.
The Right Hon. Vernon Hartshorn, M.P.
Sir Hugo Hirst, Bt.
Sir David R. Llewellyn, Bt.
Mr. A. K. McCosh.
The Right Hon. Sir Alfred M. Mond, Bt., M.P.
Sir W. Harry Peat, K.B.E.
Mr. Frank B. Varley, M.P.
Mr. J. A. Warriner.

The Secretary to the Committee is Mr. E. Fudge, of the Mines Department, Dean Stanley Street, Millbank, S.W. 1.

PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS EXHIBITION—NOVEMBER, 1927.

Competition of Papers for Awards.

The Congress Organizing Committee have decided to offer the following prizes for papers which are submitted for discussion at the Congress to be held in November, 1927:

First Prize.—Gold Medal and £50.
Second Prize.—Silver Medal and £25.
Third Prize.—Bronze Medal and £10.

The competition is open without restriction of nationality.

The subject of each paper must be one which falls within the services covered by the Congress—that is to say: Highways and Bridges, Water Supply, Sewerage and Sewage Disposal, Cleansing, Gas, Electricity, Housing and Town Planning, Tramways and Light Railways, Agriculture (Small Holdings, Land Drainage, Land Reclamation, and Agricultural Education), and Local Government Organization.

Papers must be submitted not later than Jan. 17, 1927.

Application for the rules of the competition must be made to the Hon. Secretary, Public Works, Roads and Transport Congress, 84, Eccleston Square, London, S.W. 1.

Papers may be submitted for discussion at the Congress without being entered for competition. Such papers should be clearly marked "Not for competition."

GAS-WORKS AS FEEDERS OF ELECTROMOBILES.

Recently a meeting was held at the Cecil to inaugurate an Association especially for the aid and convenience of those who have adopted, or intend to adopt, electricity as the means of propelling vehicles, tractors, locomotives, vessels, &c., in the United Kingdom. The Chairman on the occasion was Mr. J. C. Elvy, who is a Consulting Electrical Engineer. In his opening address, he made some caustic remarks regarding the attitude of not a few electricity supply undertakings in maintaining unduly high prices for electrical energy for certain purposes in this country; and he advocated calling to the aid of electromobile users all owners of electricity generating plant (especially direct current type, as being more suitable than the national alternating current standard), even where there are already electricity supply authorities in existence. He is of opinion that gas undertakings (which are always fully alive to new business possibilities, and to the interests of their customers) which generate electricity for their own purposes would welcome another source of revenue by supplying low-priced units, which would help to reduce the overhead establishment charges on their plant, for charging storage batteries during the night hours. We are wondering what would be the legal position of the gas-works with an electricity supply undertaking in the district. However, with several years' practical experience in electricity supply undertakings, Mr. Elvy's remarks are worthy of serious consideration. Readers will remember that his name has already appeared in the "JOURNAL" (for instance, on Feb. 11, 1925, p. 351) in connection with the question of amalgamating electricity generating stations with gas-works.

Will.—Mr. Henry Pullman, of Addison Crescent, Kensington, late Chairman of the Richmond (Surrey) Gas Company, and a Director of the Hampton Court Gas Company and of the Walton-on-Thames and Weybridge Gas Company, who died last May, at the age of 73, left unsettled property of the gross value of £91,670, with net personalty £87,371.

ELECTRICITY SUPPLY MEMORANDA.

THE Standing Committee who have been dealing with the Government Electricity Bill completed their labours last Thursday, after having been occupied by the discussion of clauses, amendments, and new proposals for no less than twenty-seven sittings. This is better than was expected at the earlier stages of the Bill, when very slow progress was made. Hard things were then said, by those who were piloting the measure through Committee, of those who worked diligently and more or less eloquently to obtain amendments which the Government were not willing to concede. However, the work is done; and the Bill (at the time of writing) is ready to be reported to the House of Commons for third reading. After that, it will have to face the House of Lords, but it is not likely to get through the whole of the remaining stages before the autumn session. The main principles of the measure have not been changed. Perhaps the most noticeable alteration which has been effected is that, where it is considered the proposals will involve hardship on electricity undertakings and others, the matter can be referred for decision to an independent arbitrator, or to settlement by a Special Order, which will require confirmation by Parliament. In respect of technical matters, the Electricity Commissioners will still be the deciding authority; and the duty of preparing schemes is now to devolve upon the Commissioners and not upon the Central Board, who will, from the business point of view, approve of them, or make any alteration in them which they deem necessary. Certain concessions have been granted at the instance of local authorities who own electricity stations. For instance, a modification of the first schedule has been made dealing with the price to be paid on a station being compulsorily acquired. A number of new clauses were introduced for consideration; but the Government decided that the scope of the Bill could not be extended indefinitely. They only allowed one or two new clauses which, it is believed, will facilitate the distribution of electricity; but the other amendments it was determined should be dealt with at some future date in a Bill to consolidate existing electrical legislation. But more as to the changes when the Bill is available in amended form.

Committee Stage Ended.

Hiring and Wiring Powers.

The attempt of the Incorporated Municipal Electrical Association to secure through the Government Electricity Bill a clause giving power to all electricity undertakings to sell fittings, apparatus, and appliances, has not met with success. When the clause, which is virtually the Swindon one (to which reference has been made in previous "Memoranda"), was introduced to the Standing Committee, it was discussed at some length, but was refused by seventeen votes to eleven. It will be remembered that the Swindon clause was the subject of an agreement between the Municipal Electrical Association and the Electrical Contractors' Association; and it was considered that, in view of this agreement, it would not be difficult to make a somewhat similar clause universally operative where local authorities are the electricity purveyors. The view has proved to be wrong; and electricity undertakings who require the powers will, as hitherto, have to apply for them individually in Bills or Special Orders.

Gas Undertakings and Electricity Powers.

There is some question as to how far the clause will be of real value which has been inserted in the Government Electricity Bill, at the instance of the National Gas Council, on behalf of the gas industry. The clause provides that, where a gas undertaking applies for a Special Order, and the Electricity Commissioners decide that they are unable or unwilling to grant it, the matter shall be referred to the Minister of Transport, who, subject to compliance with the requirements of the Electricity Supply Act, 1919, may, if he thinks fit, make the Order, which will have effect as if it had been made by the Electricity Commissioners, and confirmed by the Minister of Transport. That is good so far as it goes; but it will much depend upon how effect is given to the clause, which seems to be an open matter. The clause only provides for the submission to the Minister of an Order promoted by a gas undertaking which has not received the endorsement of the Commissioners; but it does not say whether or not there is to be any direct appeal by the promoters to the Minister of Transport, or whether he will be prepared to hear arguments on their behalf in favour of the granting of the Order. If the Minister is to come to a decision merely on the representations of the Commissioners, then we fear the clause will be of little value. The Electricity Commissioners constitute a department of the Ministry of Transport; and, in effect, the Commissioners are the electrical advisers to the Minister. If, on the other hand, the Minister will be in a position to hear a statement of the case on behalf of the promoters, and thus deal with the Order independently and judicially, then all should be well. It is not pleasant for a great industry such as that of gas supply to have to take any course which infers prejudice on the part of such a body as the Electricity Commissioners; but we have the report which they made on the Statutory Gas Companies (Electricity Powers) Bill still jingling in our ears, and that report showed strong antipathy on their part to gas undertakings being allowed to become electricity suppliers, other than in abnormal circumstances. It is really the Commissioners' own fault that this matter should have been raised; and, although they have stated that they have no objection to the clause which has been inserted on behalf of gas undertakings, we still recognize that the Commissioners are a power behind the throne at the Ministry of Transport.

Cost of Electrical Equipment.

An interesting estimate has been made as to the cost of electrically equipping, with electricity for lighting, heating, and cooking, two dwellings on the Housing Estate of the Hull Corporation. It is stated that the equipment will increase the cost of each house by £90. That is a good round sum for dwellings such as are usually built in connection with municipal housing schemes. It is mentioned that the houses will be occupied by employees of the electricity undertaking who will be qualified to superintend the test, and see that the equipment is properly used. Of course, the bulk of users of domestic electrical appliances are not employees of electricity undertakings, and are not qualified to superintend a test of an electrical equipment, and to see that it is properly used. This being so, the Hull test is being made in circumstances which do not represent normal working conditions in a household.

Partial Electric Houses.

On municipal housing estates, where the electricity supply is under the administration of the local authority, specimen so-called "all-electric" houses are springing into fashion. On the Burnage housing estate of the Manchester Corporation, which when complete will have upon it 610 houses, the Electricity Department have rented a house for the purpose of showing how they would fit-up such a dwelling, so to promote the use of electricity in domestic operations. The rent of the houses is 19s. 9d. per week, including rates. Each house contains a small hall, a parlour, a living room, a kitchen-scullery, three bedrooms, and a bathroom. The lighting is by electricity; for electric heating, two 2-KW. fires have been provided; also a 3-KW. 10-gallon wash-boiler. A standard cooker is included at a rental of 5s. per quarter; and combined with the cooker is a three-pint self-contained electric kettle, which indicates the conviction of the Department that the usual hotplate, due to poor efficiency, is not an economical thing for the provision of small quantities of hot water. Plugs are fixed in each of the living-rooms and the bedrooms for heating. Apparently the electric fires will have to be moved from room to room as required. The house is provided with one coal fire grate fitted in the living room. This heats the domestic water supply, and also an oven, which is at the back of the fireplace, and to which access is obtained from the scullery. It will be seen from this that the description, "An All-Electric House at Manchester," is a "terminological inexactitude." It also testifies to the fact that the Department are of opinion that electricity standing alone cannot, with economy and due efficiency, meet with the needs of people who will occupy such houses. Among the other information given is that the charges will be on the "all-in" tariff, which consists of a fixed charge of 20 p.ct. on the pre-war rateable value, or its equivalent, and a running charge of ½d. per KW.-H. In the case of the house described, the fixed charge is 17s. per quarter, which means £3 8s. per annum, *plus* the ½d. per unit consumed.

A Scheme Declined.

We see that the Edmonton District Council have declined a proposal that electric cookers shall be introduced into what is known as their No. 3 housing scheme. The Committee concerned in the matter were, earlier in the year, in communication on the subject with the North Metropolitan Electric Power Supply Company, who submitted proposals with regard to both lighting and the installation of electric cookers. Arrangements had already been considered for the supply of lighting; the Company's terms being to supply current for this purpose at 1s. 3d. per week, but with the obligation upon the Council to collect the sum with a reduction of 5 p.ct. for expenses, and, in addition, 6d. to cover rental charges on the equipment—making in all 1s. 9d. It was pointed out by the Company that the cost of running the additional mains required for a supply to cookers and the alterations to the mains at present in existence, would be very heavy. Furthermore, it was desirable to instal a robust cooker; also for quick boiling, where small quantities of water are needed, a separate kettle with self-contained unit should be provided, and be purchased outright on hire purchase (spread over a year), at a charge of 7d. per week. With the cookers, the scheme proposed the use of shilling-in-the-slot meters, the current to be taken for boiling,

lighting, and cooking at the rate of 1d. per unit. The Edmonton Housing Committee considered the price was prohibitive. Therefore no action is to be taken for the installation of cookers in the houses.

Fires and Failures. Our electrical friends are prone to ridicule all references to the fire-generating propensity of electricity; but we do not think they will deny the authority of the Highways Committee of the London County Council when they assert that certain outbreaks of fire have occurred through electricity in certain premises in Kensington. These outbreaks have been under the consideration of the Committee; and the allegation has been made that they are due to defective electric street mains. The Committee have brought the matter to the attention of the Electricity Commissioners, and have urged upon them the desirability of revising their regulations, with a view to minimizing the possibility of fires occurring as a result of defects in the street cables. Turning to Leeds, we see that "a slight breakdown" at the Corporation power station, on the night of July 14, resulted in the whole of the parts of the city relying upon electricity being plunged into darkness. Not only were all the domestic consumers affected, but street lamps (other than those supplied with gas), theatres, and picture palaces suffered loss of business, excepting those fortunate ones who have their own power plant, and were quite oblivious that anything untoward had occurred to their less enterprising contemporaries.

POSEN GASHOLDER EXPLOSION.

Views in France.

Further comment upon the Posen gasholder disaster on Feb. 26 last has appeared in the columns of our contemporary, the "Journal des Usines à Gaz." One can well imagine, it says, the stir caused by this event among the users and the builders of tankless holders; and an endeavour must be made to decide where to lay the blame—upon the principle of these comparatively new apparatus; upon some particular imperfection of one of the first built; or upon insufficient supervision, through the following of that old practice which laid down the necessity for only very rare visits to gasholders.

After a brief description of the characteristics of the tankless gasholder, our contemporary remarks that the level of the disc as it rises and falls is assured by rollers guided along the apices of the shell. These rollers are in superposed pairs, each pair carried by a single framework. In more modern examples, each radial framework is braced to those on either side by a series of joists; a rigid ring being thus formed round the disc. In the case of the Posen holder, however, this lateral stiffening did not exist; and so there was only comparatively small resistance to any radial force tending towards collapse of the roller frames against the disc.

The article proceeds to relate the known facts of the occurrence (these have already been brought fully to the notice of our readers); and it is pointed out that the explanation of the contractors—displacement of the disc by tar, and its temporary correction by altering the position of the concrete weights—tallies with the evidence. But it is pointed out that sufficient stress has not been laid on the fact that gas was noticed above the disc the day before the accident, which indeed caused a stoppage of working while it was investigated. There must, therefore, have been some fault in the gas-tightness; and if this went on for a certain time, gas would accumulate above the disc, even though the fact was not revealed in the meter house, owing to the slowness of the escape.

Among the possible causes of a gas escape, one can cite, first, bad contact of the small plates which press the outside of the seal trough against the sides of the holder, more particularly the angle plates. It is stated to have been often noticed that the distance between a given counterweight and the edge of the disc varies with the height of the latter in the holder. It might even come about accidentally that the counterweight touches the disc, in which case, of course, gas-tightness is immediately compromised. Nevertheless, if such an eventuality is noticed, it is easy to remedy the fault by bending the counterweight shaft; but the immediate cause of such a happening must be deformation of the shell through faulty construction, subsidence of the ground, or bending of the levers through their jamming during a too rapid descent of the disc such as might be produced if two holders, throwing different pressures, were put into parallel without necessary precautions. Obviously it is difficult to say whether one or another of these conditions was fulfilled at Posen; but it can be stated (1) that the holder was comparatively old, and that its construction might have been insufficiently accurate, to the extent that the sides of the tank were not perfect; and (2) that one of the M.A.N. engineers noticed that at the time of the accident the holder had been paralleled with ordinary holders.

CONCLUSIONS.

As regards the first question asked above: Is the principle itself to blame? Evidently not, says the "Journal des Usines à Gaz," since a very large number of such holders are working satisfactorily in all parts of the world, presenting real advantages from the points of view of first cost, ease of construction on ground liable to subsidence or infiltration, and the possibility of obtaining dry gas.

Was it then the imperfection of one of the first dry holders built? The answer is in the affirmative. To the absence of cross bracing, referred to above, there is added as a probable cause the defective contact of the plates. But it is pointed out (1) that there are no other tankless holders which embody the same imperfection, and (2) that as regards the plates any fault may easily be remedied by proper supervision. As for the angle plates, which are the most delicate, the replacement of the lever and counterweight by a spring-pressed shaft solves the problem in a satisfactory manner.

SUPERVISION.

There remains the important question of maintenance. Without doubt, there was some negligence in allowing the spilt tar to remain on the disc; and supervision of the tar itself and of the working of the pumps is of prime importance in these holders.

As regards the tar, there has generally been observed a tendency for it to thicken through the presence of asphaltic matter. This deficiency is corrected by the addition of anthracene oil; that used for gas washing appearing to be particularly suitable. However, one must keep within close limits, and take care not to make the tar over-fluid, resulting in too rapid circulation, in excess of the pump capacity. Samples of the tar should be taken periodically for test purposes. Its viscosity should be about 10° Engler at 50° C.; and it must not solidify at −20° C. Another important point is not to allow water to collect on the surface of the tar—it impairs the gas-tightness and in winter presents the danger of stoppage through the pipes freezing. In this regard there is a widespread erroneous belief that warming the tar feed tank will give additional fluidity during cold weather. Actually, such an arrangement merely prevents the water, which is always present to a small extent on the surface of the feed tank, from forming a coating of ice and so impeding free working of the ball valve. As for temporarily increasing the fluidity of the tar, such is very quickly lost as the tar rises up the pipe to the top distributing tanks.

The article further emphasizes the necessity for close attention as regards both the number of the pumps and their periods of running. If the tar is too fluid, if a plate is pressed insufficiently hard against the shell, if for any other reason the tightness of the joint becomes defective, one will observe immediately an increase in the length and frequency of pump runs. Under normal conditions each run is about ten minutes, and the number of runs may vary from four per 24 hours in winter to 20 in summer—though these figures have no universal application. To facilitate control, it is particularly useful to attach to the motors an electric indicating system, which lights a lamp or works a pen when a particular motor functions. If to these precautions one adds a daily inspection of the mechanical parts, and from time to time an analysis of the air above the disc, one can rest assured of being able to take any necessary steps in plenty of time.

In conclusion, the "Journal des Usines à Gaz" says that the Posen accident was most probably due to a defect in construction which exists in no other tar-jointed gasholder. This type has come to stay, and renders good service providing sufficient supervision is granted it—one must not treat it like a wet holder, which is too often looked upon as a piece of boiler work and carpentry that only requires occasional visits. The dry holder is a machine, the working of which must never be neglected.

Iron and Steel Institute.—The autumn meeting of the Institute is to be held at Stockholm, on Aug. 27 and 28. A number of papers will be submitted at the business sessions in the Palace of the Nobility; and there will be alternative visits to works and mines in Central Sweden.

Ten-Million Feet Tankless Holder.—For the Pacific Gas and Electric Company, the Bartlett Hayward Company are now erecting in East Oakland a waterless type gasholder having a capacity of 10 million c.ft. The holder is being constructed of flanged steel plates 32½ in. wide and 27 ft. 10⅜ in. in length.

CONGRESS OF CHEMISTS IN LONDON.

MEETINGS OF THE SOCIETY OF CHEMICAL INDUSTRY AND THE INSTITUTION OF CHEMICAL ENGINEERS.

Last week, from July 19 to 23, there took place in London, on the occasion of the annual meetings of organizations devoted to their interests, a largely attended congress of chemists. We report those portions of the proceedings in which "Journal" readers will be more particularly interested.

INSTITUTION OF CHEMICAL ENGINEERS.

The Annual General Meeting of the Institution of Chemical Engineers was held at the Central Hall, Westminster, on July 19—Sir FREDERIC NATHAN (the President) in the chair.

The PRESIDENT moved the adoption of the annual report and accounts.

Prof. J. W. HINCHLEY (Hon. Secretary) called attention to the fact that the membership has increased by about 20 p.ct. during the past year, and that the work of the Education Committee has made considerable progress with regard to the teaching of chemical engineering in the universities. More than one university, he said, is engaged in considering the subject, and one has decided to take a definite step forward during the coming year.

Mr. F. H. ROGERS (Hon. Treasurer) presented the accounts, and said that, though there was a slight deficit on last year's working, there is a small balance in hand, owing to a previous balance. The Institution are now in the fortunate position of being able to relieve the guarantors of their liability.

The report and accounts were adopted.

The result of the ballot for Officers and Council was as follows:

President.—Sir Frederic Nathan, K.B.E.
Vice-Presidents.—Sir Alexander Gibb, G.B.E., and Mr. W. Macnab, C.B.E.
Hon. Secretary.—Prof. J. W. Hinchley.
Hon. Treasurer.—Mr. F. H. Rogers.
Members of Council.—Messrs. C. S. Garland, H. Talbot, and Prof. E. C. Williams.
Associate Member.—Mr. R. G. Browning.

The meeting approved of a modification in the Articles of Association with the object of slightly tightening-up the conditions of membership.

Cordial votes of thanks were passed to the President, Council, and honorary officers.

The PRESIDENT acknowledged the vote, and expressed his special gratification at being elected President for the second year.

PRESIDENTIAL ADDRESS.

Sir FREDERIC NATHAN then delivered his Presidential Address, in which he dealt with the subject of "Industrial Efficiency, with Special Reference to the Elimination of Waste." The first part of the address considered in some detail the problems of industrial psychology and vocational training, and reference was made to the position of America in this matter. The opinion was expressed that in this country scientific industrial development is making slow progress, due in great measure to the conservatism of employers and the distrust of employees of any changes in their working conditions. There are, however, very distinct indications that, on the one hand, employers are realizing in increasing measure the value of the application of scientific principles to industry, and, on the other hand, that organized labour is also tending in the same direction. In this way the physical and mental welfare of the human factor has come to be more and more recognized as an essential element of industrial progress.

Passing from labour, or the human factor, to material, the President said that the question of economy in the consumption of raw materials has not, so far as he is aware, been the subject of much systematic investigation or general discussion. There are several influential organizations in existence, such as the Federation of British Industries and the British Chemical Manufacturers' Association, although he did not know to what extent their constitution would enable them to take up the question of industrial efficiency in its relation to the elimination of waste. In many of the important industries there are research associations, and their objects would include the investigation of the problem of the elimination of industrial waste and the employment of suitable advisers for dealing with it. In the promotion of increased industrial efficiency as applied to the elimination of industrial waste lies one means of decreasing the cost of our commodities. He expressed the hope that a matter of such great importance to this country will receive the consideration it requires from all those bodies capable of dealing with it, and that concerted action may be taken.

ANNUAL DINNER.

In the evening the annual dinner was held at the Great Central Hotel—Sir Frederic Nathan presiding over a large company, which included Sir Frank Heath (Department of Scientific and Industrial Research), Sir Joseph Petavel (Director of the National Physical Laboratory), Sir Arthur Duckham, and Mr. W. J. U. Woolcock (President of the Society of Chemical Industry).

Apart from the Loyal Toasts, there was only one submitted—"The Institution of Chemical Engineers"—which was proposed by Sir FRANK HEATH, who said the function of the Government is not to solve the problems of industry, but to open promising doors through which the leaders of industry might pass and solve their problems for themselves.

Sir FREDERIC NATHAN, replying, remarked that, while the steady increase in membership is very satisfactory, the Institution has always placed in the forefront of its activities the promotion of the objects for which it was originally founded—namely, to encourage the study of chemical engineering, to give its obvious importance to national industry some place in our educational system, and to act as a qualifying body. To give effect to these objects the Education Committee of the Institution have worked out a scheme for the training of chemical engineers. This scheme has met with the approval of industrial authorities; and there are also very good prospects of the universities, technical colleges, and other educational institutions arranging or modifying courses to enable scholars to study the subjects special to the training of a chemical engineer. Admissions to the Institution have hitherto been made by the Council on the recommendation of the Nomination Committee, based on the requirements of the by-laws. Arrangements have now been made, however, for the Institution to hold its own examination. The Council exercise the greatest care in the election of members, in order that the possession of the diploma of the Institution may be a guarantee of the fitness of the holder.

SOCIETY OF CHEMICAL INDUSTRY.

MESSEL MEMORIAL LECTURE.

On Monday afternoon, at the Mansion House, the Messel Medal was presented to, and the Messel Memorial Lecture delivered by, the Rt. Hon. the Earl of Balfour, K.G., O.M., F.R.S. The medal was presented by H.R.H. the Duke of York, K.G.; and the Rt. Hon. the Lord Mayor (Sir William R. Pryke) presided.

The Messel Memorial Lecture and Medal were instituted by the Society in 1922, as one of the methods of carrying out the wishes of the late Dr. Rudolph Messel, a former President, who bequeathed about £20,000 to the Society for the furtherance of scientific research and such other objects as the Council might determine.

The LORD MAYOR welcomed those present, and Mr. W. J. U. WOOLCOCK, C.B.E. (President of the Society), returned thanks.

The EARL OF BALFOUR, in the course of his lecture, said: I happen for the time being to be the head of that Department of the Government which, more than any other Department, concerns itself with industrial research. The President has happily remarked that chemistry, or this Society, which has chemistry for its subject, has one foot in industry and one foot in scientific investigation. That precisely describes some of the duties which my Department has had placed upon it, and which we endeavour, to the best of our ability, to fulfil. The relation of Government to scientific research must always be a difficult one, must always lend itself to a certain amount of controversy, and cannot be, I think, accurately embodied in any given formula. Indeed, the attempt, I think, so to embody it would only lead to pedantic difficulties, and it would be mere folly to draw too sharply the distinctions between that which the Committee of Industrial Research ought to do and that which it ought not to do. The line is not precise. It must depend upon the particular exigency of the moment and the particular character of the problems that have to be dealt with. But, nevertheless, I do think the Department is capable of performing a very useful function in the State; and I may say without hesitation—as I deserve none of the credit—that it has already, in the not numerous years of its existence, performed great services for the public.

Some people might perhaps be inclined hastily to suggest that this country is labouring under some disadvantage in the fact that it is very small in point of area, that it does not possess, apart from the other portions of the Empire, those material resources which, no doubt, are an essential to successful industry. But a friend of mine, connected with the Department of which I happen to be the head, made an observation to me which I thought of great interest, and which may perhaps be of interest to you. He pointed out that, if you consider the trend of modern industrial investigation, you will find that the current is running in a direction which really minimizes the variety of raw material which has to be used by industry before the products of industry can reach their existing variety. He

pointed out to me the number of great commercial interests which depend upon nothing more than the proper use of coal, of water, and of air; and of coal, when it is extracted, and of water and of air, there ought to be no lack in this country, whatever else we may feel the want of.

If you ask me to describe the sort of thing he had in mind, it was this. He pointed out that the heavy chemical industries depended more and more on coal as raw material, distinguished, you will observe, from coal as a source of power, light, or heat. Coal, supplemented by air and water, is more and more becoming the raw material of some of the most valuable products of human industry. The great process of synthetic ammonia, which has only come into being really since the war, is a vast and a growing industry. It ministers to the agricultural interests of every nation in the world. It is required by our own agriculture not less than by the agriculture of other people; and that great industry of synthetic ammonia requires essentially nothing except coal, water, and air. It is quite true, as I understand the matter, that sulphur is required as a vehicle for the most common form of synthetic ammonia before it can be used agriculturally; but that is an accident. It is not of the essence of the process; and I am told that the most powerful fertilizers do not use sulphur, and that they consist, therefore, of the elements which I have already enumerated—coal, water, and air.

That is a remarkable triumph of industrial development; but there are others which, in the long run, may be not less important. I am not going to discuss—for many reasons, of which incompetence is not the only one—technical details; but I believe that every chemist here will admit the accuracy of my statement when I say that all the industries which depend upon the production of methyl alcohol, which are many, and which are growing in number and in importance, again require nothing in the shape of raw material for their production but the three things I have mentioned—coal, air, and water. It is an interesting reflection that out of coal, air, and water, and nothing else, you will see most valuable insulators for electrical work, and the most charming handles of smart umbrellas, carved or moulded, and of admirable texture. Then go a little further, to something which may be of more importance—it probably is of more immediate importance, though I do not know about its ultimate development—and consider raw coal as the material for other forms of fuel. I am not going to talk to you about a matter which has lately engaged—and I think has rightly engaged—public interest and attention. I mean low-temperature carbonization. Low-temperature carbonization is on everybody's lips; and I believe it to be a very valuable and interesting process, which is on the way to accomplishment. I say nothing about it now, because I believe you have been invited by my Department to see what is being done at the Fuel Research Station.

I cannot, however, resist the suspicion that it is not so much in the direction of low-temperature carbonization that we shall see great fuel developments, as in some process or other of the direct hydrogenation of coal. There is one of which a good deal has been heard, and which I believe is technically quite feasible, known as the Bergius process; but I am far from suggesting that that is the only process, or that it is the best. Nevertheless, that by some process or other the hydrogenation of coal can be accomplished, I have not the slightest doubt; and of its importance when it is accomplished no human being could entertain any doubt. What is it going to do, if and when it succeeds? It will give you what you can now only get successfully, broadly speaking, from the oil wells of the world. The oil wells of the world, even supplemented by what you could get out of a successful process of low-temperature carbonization, are probably going to be quite inadequate for the growing demands which are made upon that particular species of fuel by operations which are going on before our eyes. It is impossible to doubt that the strain upon the oil resources of the world are augmenting, and are going to augment. I do not doubt that the fuel resources in oil wells are also going to increase; but I find it very hard to believe that the demand for those particular products will not tend to outstrip the supply; and I am convinced that, at all events so far as this country is concerned, it would be an incalculable advantage if we could supplement any supply of this kind of fuel which comes to us from overseas by some process which would enable us to turn our coal, to any extent we desired, into these various fuels of which I am speaking. I see no reason to doubt that sooner or later that will be accomplished.

I do not doubt that sooner or later—and it may be sooner—we shall see these great developments which again will show how enormously this country, poor as it may seem in a certain variety of raw material, has, nevertheless, the kind of raw material to which chemical industry can go for variety, and can turn to every sort of account, and, by all the magic of organic chemistry, can give us products of the most varied kind, from dyes and medicines to heavy oils and light oils, and so on, and thereby not merely further the prosperity of great corporations, and the employment of vast numbers of workers, but add directly to the comfort of every single individual within our narrow and crowded frontiers.

On the motion of Dr. E. F. Armstrong, F.R.S., Mr. C. S. Garland, and Mr. Woolcock, hearty votes of thanks were accorded to Lord Balfour, the Lord Mayor, and H.R.H. the Duke of York.

Annual General Meeting.

The Annual General Meeting of the Society was held at the Hotel Great Central, Marylebone, on Tuesday—Mr. W. J. Uglow Woolcock, C.B.E. (the retiring President), in the chair.

The following were unanimously elected to fill the posts indicated:

President.—Mr. Francis H. Carr, C.B.E.

Vice-Presidents.—Prof. P. P. Bedson, Dr. Bernard Dyer, Sir James Walker, F.R.S., and Mr. W. J. U. Woolcock, C.B.E.

Ordinary Members of Council.—Mr. D. Lloyd Howard, Dr. Percy May, Dr. E. W. Smith, and Mr. John H. Young.

The annual report of the Council showed that the membership on July 20, 1926, was 4802, compared with 4831 on July 14, 1925. Since the last annual meeting 367 members had been elected, and the losses through death, resignation, &c., were 396.

Mr. E. V. Evans and Dr. H. Levinstein have been re-elected Hon. Treasurer and Hon. Foreign Secretary respectively.

The Fuel Section, the formation of which was recently authorized by the Council, with the object of co-ordinating the work of the local sections upon all subjects relating to fuel, will co-operate with the local sections in arranging meetings at which fuel subjects of particular local interest will be discussed, and with outside organizations such as the Coke Oven Managers' Association in arrangements for special symposia of technical, scientific, and practical value. Membership of the Section is open to all members of the Society on payment of an annual registration fee of 5s. The Committee of the Section is as follows: Prof. Arthur Smithells, F.R.S. (Chairman), Prof. W. A. Bone, F.R.S., Prof. J. W. Cobb, C.B.E., Mr. E. V. Evans, Mr. C. S. Garland, Mr. A. McCulloch, Mr. W. J. U. Woolcock, C.B.E., with Dr. E. W. Smith and Mr. H. Talbot as Joint Hon. Secretaries.

Mr. Woolcock delivered his Presidential Address, which took the form of a brief review of the work of the Society during the two years of his Presidency. It had been his aim to encourage and extend in every possible way the scheme of co-operation with allied societies, which had been consistently kept in the forefront of the Council's policy for a good many years. This co-operation, which had been carried on successfully in the past, had been gradually extended in scope, until this year they had, for the first time in the Society's history, been able to make the annual meeting the nucleus of a congress of chemists, representative of sixteen Scientific and Technical Societies and Associations, in addition to the Society itself. The cordial co-operation which had been shown among these bodies on this occasion augured well for the future of British chemistry. With regard to the newly-formed Fuel Section, he emphasized that it would co-operate with the local sections, and would join with them in arranging meetings at which matters relating to fuel research and practice would be discussed. Towards the close of this year there would be a conference in Manchester on "Tar."

On the motion of the President, seconded by Mr. E. V. Evans, the report and accounts were unanimously adopted.

It was resolved to accept an invitation by the Edinburgh and East of Scotland Branch to hold the annual meeting next year in Edinburgh.

Mr. F. H. Carr (the newly-elected President), proposing a vote of thanks to Mr. Woolcock for his work on behalf of the Association during his two years of office, said that in presidential achievement he stood second to none of the long list of distinguished Presidents.

A vote of thanks was also accorded to Mr. Evans for his able services as Hon. Treasurer throughout a difficult financial period.

Corrosion.

On Tuesday morning there was a symposium on corrosion, held under the auspices of the British Chemical Plant Manufacturers' Association, the Institute of Metals, the Institution of Chemical Engineers, and the Chemical Engineering Group of the Society of Chemical Industry. This will be dealt with in a later issue of the "Journal."

On Wednesday, there were addresses by Sir Josiah Stamp and Sir Max Muspratt. The former spoke on the subject of the economics of monopolies of raw materials, with particular reference to America; and the latter dealt with some of the problems of the sulphuric acid industry.

Smokeless Fuel.

On Friday Dr. E. W. Smith opened a further discussion on this subject, which was commenced at Leeds and continued at Sheffield last year. His remarks are reproduced elsewhere in this issue.

BRITISH CHEMICAL PLANT MANUFACTURERS' EXHIBITION.

In connection with the congress, there was held during the week, in the Central Hall, Westminster, an exhibition organized by the British Chemical Plant Manufacturers' Association,

in order that visitors might judge for themselves the excellence of British plant and of British materials for plant construction. The Association are convinced that for the future well-being of British chemical manufacture (as well as in the interests of makers of plant) it is essential that the plant used in this country shall be made by British manufacturers. They have therefore secured the co-operation of all British plant manufacturers, irrespective of their membership of the Association, in an arrangement whereby inquiries will be directed, through the Association, to the manufacturers best fitted to undertake the production of the desired plant. A Special Committee of the officers of the Association will assist in securing this end, if the inquiry cannot at once be met from the information at the disposal of the Secretary. When, therefore, intending purchasers have any difficulty in obtaining a particular article, they are requested to communicate immediately with the Association.

The formal opening of the exhibition, on Monday morning, was largely attended; the gas industry being fairly represented. Dr. R. Seligman (Chairman of the Association) presided, and gave some information with regard to the origin of the Association. Sir Max Muspratt, Bart. (President of the Federation of British Industries), in declaring the exhibition open, remarked that the chemical industry is one of the most changing industries that can possibly be imagined. It has over a period of years so grown and altered that even middle-aged people feel themselves entirely antiquated and out of date. The chemical industry, proceeded Sir Max, is learning to do without coal; and he has no doubt that, if necessary, it will be able to adapt itself to doing without coal altogether. The English chemical industry was developed on cheap coal, and the German chemical industry on dear coal. Now the position is reversed, and we have to approach our problems from an entirely different point of view.

The Exhibits.

The exhibits, which had been arranged in the basement, numbered forty, and made a remarkably good showing—bearing in mind the limited amount of space available and the short period during which the exhibition was to remain open. The wide variety of articles to be seen was divided roughly into two classes: (1) Materials suitable for chemical engineering; and (2) plant and apparatus. It was, of course, in connection with the latter class that space limitations presented the greatest difficulty.

Lessing Contact Rings.

There was a display by the Hydronyl Syndicate, Ltd., of 317, High Holborn, W.C., of Dr. R. Lessing's patent contact rings, for packing scrubbers, absorption and reaction towers, distilling columns, and similar plant. An advantage claimed for these is that they expose a greater surface, and occupy less volume for a given size of unit, than any other type. These rings, which have long been in successful use in gas and other works, consist of uniformly shaped cylinders of sheet metal, having a central partition which adds about one-third to the contact surface, and acts as an additional baffle. The rings are packed indiscriminately into the towers or other vessels to be filled; and by this irregular arrangement of the packing units to each other, and by their special construction, a liquid descending, and gases or vapours ascending, a tower are continually deflected in their path, whereby a high degree of turbulence and intermingling is obtained, and channelling is entirely avoided. Also the peculiar design of the rings gives them a high drainage capacity; and this, with the small volume occupied by the metal, greatly reduces the back-pressure exerted by the packing. The contact surface afforded varies from 35 sq. ft. per c.ft. of tower space with 2 in. rings, to 368 sq. ft. per c.ft. with ½ in. rings. The 1 in. rings (the most popular size) have 70 sq. ft. of contact surface per c.ft. of tower space.

Knowles Electrolytic Cells.

An interesting exhibit by the International Electrolytic Plant Company, Ltd., of New Crane Street, Chester, actually formed part of a Knowles plant of 800 cells now being erected in France. It is believed that this will be the largest electrolytic hydrogen and oxygen producing plant in the world, with an output of nearly 100,000 c.ft. of hydrogen and 50,000 c.ft. of oxygen per hour, intended to work in conjunction with a Casale plant in the manufacture of synthetic ammonia. The 800 cells are laid out in 40 rows of 20 cells each, with a set of feed water and gas washer tanks to every two rows. The exhibit represented the end cells of two rows, with feed and washer tanks. Each cell is arranged for a working current of 7500 amperes, the whole plant absorbing 15,000 KW. Special water-cooling elements are built into the cells, however, in order that the current may be increased to 8600 amperes without overheating, enabling the plant to deal with large fluctuations in the power supply, and thus taking full advantage of "off-peak" loads.

The patent "Merco" plug valve (the invention of Mr. S. J. Nordstrom) has as its underlying principle the combination in a plug cock of lubricant ducts and a lubricant chamber at the base of the plug. Because of the design, a full 100 p.ct. opening in the plug is assured. The valve is manufactured by the Audley Engineering Company, Ltd., of Newport (Salop), who show an illustration of a 16-in. "Merco" valve as used in gas governor chambers. This size weighs over a ton.

It may be explained that in this valve the lubricating ducts and the chamber are so located that, when the lubricating screw is screwed down, the plug is lifted from its seat by an infinitesimal amount, in the same way that the plunger of a hydraulic jack is lifted by the water pressure. The plug is then free to turn. Simultaneously with this lifting and turning of the plug, lubricant is distributed from the grooves over the seating surfaces. The lubricant is renewed by the insertion of a cartridge thereof into the lubricant reservoir in the shank of the plug. A check valve is placed at the base of this reservoir to prevent the grease being forced back when inserting fresh cartridges under pressure. Extreme service conditions seldom require more than two lubricant cartridges per month for a valve under constant operation. A visible lug is cast as an integral part of the gland, and fits into a recess in the plug shank; the two serving as a positive stop in opening or closing the cock. This visible stop clearly indicates to the operator the direction in which to move the plug for opening or closing.

Materials for the Chemical Industry.

Aluminium as applied to the chemical industries was demonstrated by the Aluminium Plant and Vessel Company, Ltd., of Point Pleasant, Wandsworth, and the Broughton Copper Company, Ltd., of Manchester; "Monel" metal, for resisting corrosion and erosion, by Messrs. G. & J. Weir, Ltd., of Cathcart, Glasgow; nickel by the Mond Nickel Company, Ltd.; heat and corrosion-resisting steel by Messrs. Hadfields, Ltd., of Sheffield; and various types of stainless iron and steels which have been developed for resistance to severe conditions of corrosion and erosion were shown by Brown Bayley's Steel Works, Ltd., Leeds Road, Sheffield.

"Ironac" is the name given to an acid-resisting iron marketed by Haughton's Patent Metallic Packing Company, Ltd., of 30, St. Mary-at-Hill, E.C. It has been produced as the result of long experimenting, and is a hard and homogeneous iron alloy, which does not easily oxidize, and is said to resist the action of acids to a remarkable degree.

A new form of concrete which is resistant to corrosive liquids and gases was shown by Prodorite, Ltd., of Aldwych House, W.C. In this the portland cement is replaced by specially prepared hard pitch, which is strictly an elastic solid, with no plastic or semi-fluid properties whatever up to and beyond the temperature at which the "Prodorite" is to be used. "Prodorite" contains from 7 to 12 p.ct. of the special pitch, and about 15 to 20 p.ct. of specially selected mineral matter in a very fine state of subdivision. The rest is made up of clean aggregate such as is used for ordinary concrete, consisting of properly graded broken stone and sand. The materials are mixed together at a temperature of about 260° C. The mineral matter, aggregate, and sand may all be siliceous, in which case "Prodorite" is said to be resistant to practically all acids except concentrated sulphuric acid and strongly oxidizing acids like strong nitric acid and chromic acid; or limestone aggregate and sand may be used to resist alkaline liquors.

There was exhibited by the Thermal Syndicate, Ltd., of Vitreosil Works, Wallsend-on-Tyne, a complete range of parts for acid plant and of laboratory ware.

Plant and Apparatus.

There was a representative collection of pumps and compressors for air and gas by Messrs. Broom & Wade, Ltd., of Desborough Iron-Works, High Wycombe. Another pump on view was the Douglas concentric rotary pump (a positive, but valveless pump) made by Messrs. William Douglas & Sons, Ltd., of Douglas Wharf, Putney, S.W. There were also belt-driven horizontal double-acting pumps, by Messrs. S. H. Johnson & Co., Ltd., of Stratford, E.; and patent glandless acid pumps by the Kestner Evaporator and Engineering Company, Ltd., of 5, Grosvenor Gardens, S.W.

Distance temperature recorders and thermometers were displayed by Messrs. Negretti & Zambra, of 38, Holborn Viaduct; while British Arca Regulators, Ltd., of Windsor House, Victoria Street, S.W., also drew attention to the temperature regulators made by them.

Messrs. Thomas Broadbent & Sons, of Huddersfield, had on view a selection of their centrifugal machines for drying sulphate of ammonia, anthracene, naphthalene, and granular substances of every description—a class of machinery in which the firm have had sixty years' concentrated experience.

Gas heated and steam heated automatic stills of various sizes for the production of pure distilled water were to be seen on the stand of Messrs. Brown & Son, Ltd., of Wedmore Street, Holloway, N.

The Cannon Iron Foundries, Ltd., of Deepfields, made a good show of cast-iron tanks, pans, &c., lined with acid-resisting enamel. The firm guarantee the enamels to be free from lead, arsenic, or any deleterious ingredients; pure materials only being employed in their composition.

A complete working model of the Raymond roller mill was displayed by the Grinding and Pulverizing Department of Internal Combustion, Ltd.; and another interesting stand was that of the Leeds & Bradford Boiler Company, Ltd., of Stanningley, near Leeds, who specialize in the production of complete plants for the distillation and dehydration of tar, as

well as in benzole stills and in all kinds of riveted steel plate work.

The "Calder-Fox" scrubber, for mist formed in concentrating sulphuric acid, was exhibited by Messrs. Chance & Hunt, Ltd., of Oldbury.

CHEMISTRY HOUSE.

On Tuesday afternoon a discussion took place with regard to possible schemes of arranging a "Chemistry House." This meeting was called by the British Association of Chemists, and Mr. W. J. U. WOOLCOCK presided.

Dr. STEPHEN MIALL said this subject had been discussed for something like ten years, and attracted considerable attention after the war, when Lord Moulton interested himself in it. A scheme for raising £250,000 was ready to be launched at the time of Lord Moulton's death, when the industry was flourishing and there was a certain amount of money likely to be available for such a purpose. Then came the slump in trade, and nothing more was done until Dr. E. F. Armstrong brought forward a plan in 1924, which involved an expenditure of from £25,000 to £35,000, and, of course, related to a scheme of much smaller dimensions, which would, however, enable all the important chemical societies to be given office accommodation, lecture hall, &c., in one building. These were things urgently needed, though the original scheme included library accommodation and social facilities such as those afforded by the Chemical Industry Club. These latter, however, would have to wait.

Mr. GATEHOUSE, in the course of the discussion, said that any scheme must be economic; but he could not hold out much hope of subscriptions coming from the rank and file now, unless there was a considerable reduction in subscriptions. At the present moment the subscriptions to necessary Societies on the part of a works chemist represented about £15 per annum, whereas the average salary of a works chemist was from £300 to £350 per annum. Thus the subscriptions amounted to 5 p.ct. of the income, which was too much.

Prof. E. H. ARMSTRONG described the meeting as entirely premature, and suggested that nothing should be done until it were possible to do something on the lines of what was seen on the Continent. For instance, in Brussels there was a Palais des Sciences. He deprecated any small scheme, because he believed it would prevent the bigger scheme being developed in the future.

Dr. MIALL, in reply, said he agreed with Prof. Armstrong that the meeting was to a certain extent premature. As a matter of fact, Prof. Armstrong, himself, and others who had taken a great interest in this matter, including Dr. Levinstein and Sir William Pope, were all out of England when this discussion was organized. He did not think it would be possible to include in any such scheme as Chemistry House arrangements for one subscription to all the Societies. It was always a difficult matter to carry through schemes dealing with the organization and co-operation of various Societies; and Chemistry House in itself was a sufficiently difficult problem. For the next few years these two matters would have to be kept entirely separate. At the same time, if they were going to wait until there was to be a real Palais des Sciences, as suggested by Prof. Armstrong, they would have to postpone the discussion probably for another fifteen or twenty years.

The meeting then closed.

VISITS.

During the week there were a number of social fixtures, and visits to works and other places of interest.

On Tuesday there was a garden party at the Royal Botanic Gardens, Regent's Park, by invitation of the Right Hon. Sir Alfred Mond, Bart., M.P., and Lady Mond. Among the visits on Thursday was one to the Chemical Laboratories of the Imperial College of Science and Technology, South Kensington. Here much research work is at present in progress—in the Fuel Research Laboratories, under the direction of Prof. W. A. Bone; in the Chemical Engineering Laboratories, under Prof. J. W. Hinchley; and in the Electro-Chemical Laboratories, under Captain J. I. Finch. Other visits on the same day were to the Chemical Laboratories of University College, Gower Street, and to the National Physical Laboratory, Teddington. Another party proceeded to H.M. Fuel Research Station, East Greenwich, where provision is made for experimental work on full-sized plant. In addition to the works (equipped with various methods of carbonization, and other plant for investigations in connection with fuel), there are laboratories, both for control of the large-scale work and for special investigations, a number of which are in progress.

A party of nearly a hundred on Friday afternoon went by river from Westminster to Greenwich, where arrangements had been made for a special visit to the Painted Hall, the Chapel, and the Royal Naval Museum of the Royal Naval College. Greenwich Hospital was built by Charles II., from designs by Inigo Jones; and by William III. and Queen Anne, from designs by Sir Christopher Wren. As a hospital for seamen, it owes its origin to Queen Mary II., the Consort of William III. It had occurred to her when she had found it difficult to provide good shelter and attendance for the thousands of men who had come back to England wounded after the battle of La Hogue. While she lived, scarcely any step was taken towards its accomplishment. No time, however, was lost by William III. after her death in carrying out her wishes, as a memorial of his affection. The Naval Museum contains a large collection of models and items of interest—the Nelson relics, &c. The Painted Hall occupied Sir James Thornhill nineteen years; and he was paid at the rate of £3 per square yard for the ceiling and £1 per square yard for the walls. Since 1873, Greenwich Hospital has been used as a Royal Naval College.

NOTES ON NEW BOOKS.

Coal and Ash Handling Plant.*

The importance of efficient coal and ash handling plant in a gas-works is too great to need emphasis. Thought spent in consideration of this section of a gas-works plant is never wasted; and the design and layout of such equipment, in order to comply with a particular set of local conditions, calls for careful study of the different types and systems. For this reason "Coal and Ash Handling Plant," by John D. Troup, who is Editor of the "Engineering and Boiler House Review," though it is intended primarily for the power house and boiler house engineer, will doubtless find a place in the libraries of gas engineers. The book is clearly written and profusely illustrated by diagrams and photographs. The author has dealt with his subject in such a manner that the engineer will be able to form an opinion as to the most suitable type of handling plant for his particular purpose, and also some idea of the labour required to operate it, together with the power absorbed. The book is divided into the following sections: Handling of coal on delivery; automatic weighing; storage; conveyors; ash handling plant; aerial ropeway conveyors; flue dust removal plant; and recovery of unburnt fuel. In the last-named section are some notes on the conversion of waste ash and clinker into moulding bricks—a practice adopted by, among others, the North Middlesex Gas Company. The author is of opinion that the process is worthy of much closer attention than it has so far received from those responsible for the economic generation of motive power. When once installed and properly organized, it is largely automatic, and requires but little supervision. The modern tone of the book is indicated by the consideration which is given to the handling of coal by the pneumatic system. Though this method is, as far as coal is concerned, still in a state of evolution, available experience makes it clear that there are many conditions under which coal can be handled economically by it. The plant is simple and most flexible; as yet, however, the power consumption is high.

* "Coal and Ash Handling Plant," by John D. Troup. Published by Chapman & Hall; price, 13s. 6d. net.

Theoretical Geometry.*

This book, by A. W. Siddons, M.A., and R. T. Hughes, M.A., of Harrow, provides a continuous course of logical geometry, covering all the requirements of pupils at school, except the special requirements of mathematical specialists. The treatment is Euclidean throughout, with a modern sequence, and practically no numerical work is introduced. At the end of the book there is a chapter introducing the pupil to more advanced geometry.

* "Theoretical Geometry," by A. W. Siddons and R. T. Hughes. Published by the Cambridge University Press; price, 3s. net.

Commercial Gas Company's Dividend.—The Directors of the Commercial Gas Company have declared dividends for the half-year ended June 30 at the rates of £5 6s. 8d. p.ct. per annum on the 4 p.ct. capital stock and £5 3s. 4d. p.ct. per annum on the 3½ p.ct. capital stock (both less income-tax), payable on Aug. 16. The dividends are at the same rates as for the corresponding half-year of 1925.

"Fuel Bins."—All holders of the Pacific Gas and Electric Company have recently been painted with the words "Fuel Bin," in letters 15 ft. high, which can be seen for miles, and so provide publicity for the Company. The words "Fuel Bin" are now, the "American Gas Journal" states, regarded as the trade name for the Company. When people see these two words, they think of the Pacific Gas and Electric Company.

FUEL SECTION OF THE SOCIETY OF CHEMICAL INDUSTRY.

Solid Smokeless Fuel Discussion.

On Friday morning a meeting of the recently organized Fuel Section was held in the Regent Room at the Hotel Great Central.

Mr. W. J. U. WOOLCOCK (President of the Society), who took the chair at the opening, said a few words with regard to the first official meeting of the Fuel Section. This was not a new development of the Society in doing this particular work. The only thing that was new about it was that, instead of the work being done by a very informal Committee, such as was the case in regard to the arrangements in connection with the discussions at Leeds and Sheffield, the Society had determined to set up a Fuel Section, of which this was the first official meeting. As far as the actual work was concerned, however, it would be carried on in precisely the same way as had been done during the past two or three years; and he felt perfectly certain that the enthusiastic and full meetings that had been held on previous occasions when fuel problems had been discussed would be continued, and possibly intensified, during the lifetime of the Fuel Section. On the present occasion the meeting was a joint meeting with the Coke Oven Managers' Association and the Institution of Gas Engineers; and he wished to express the thanks of the Society to these two bodies for co-operating in this meeting, and for assisting in what he believed would happen—namely, further co-operation as time went on. Prof. Smithells had occupied the chair at all the Committee meetings of the Section, and was the leader of the movement in this matter; and they were much obliged to him for his assistance, and for taking the position of Chairman of the Section.

Prof. ARTHUR SMITHELLS, who then took the chair, said it had been very gratifying to have the President of the Society with them to open the first meeting of the new Fuel Section. It was due to Mr. Woolcock's geniality, undiminished vivacity, and good fellowship that the congress as a whole had been such a tremendous success. The reasons for the formation of the Fuel Section had been fully stated, and it was not necessary to recapitulate them. Every member of the Society knew how greatly it had concerned itself in the past with the science and technology of fuel, and with the many sides of the fuel question. It was an interesting historical fact that at the first general meeting of the Society, held in 1881 in London, fuel was the chief subject of discussion. Sir William Siemens then read a paper on "The Use of Coal Gas as a Fuel." In the first year of the existence of the Society there were discussions on gas producers and on smoke abatement. Most people like himself, whose scientific work had led them to an interest in fuel, had come to regard the Society and its Journal as occupying a central position in relation to the wide range of scientific and practical questions that arose in connection with fuel. In the present state of things, when the importance of fuel problems had become so greatly intensified, when the activity of the scientific and industrial world in these matters was so remarkable, it seemed to him in the highest degree desirable that the Society should maintain, and if possible strengthen, its services. There was no suggestion that it could usefully be superseded in the particular work it had been able to do; and he had been warmly in favour of the constitution of this Fuel Section. He regarded it as a great honour to have been appointed Chairman of the Section, and would do his best to discharge the duties of the office. It was thought desirable that on the occasion of this large Congress of Chemists, the Fuel Section should make an appearance; and it seemed that this could be most suitably achieved by the presentation of a careful summary of the papers which were read, and the discussions that took place, on solid smokeless fuel at the two conferences held during the past year at Leeds and Sheffield. This summary had been made by Dr. E. W. Smith, one of the Hon. Secretaries; and there was the promise of contributions to the discussion by gentlemen who would be able to give supplementary information as to the existing state of affairs in relation to the subject. When so many over-confident pronouncements were being made, it would be agreed that they would accomplish something useful if they did nothing more than arrive at a fair statement of the situation concerning solid smokeless fuel.

SUMMARY OF PAPERS AND DISCUSSIONS ON "SOLID SMOKELESS FUEL" DURING 1925.

Compiled by E. W. SMITH, D.Sc., F.I.C., M.I.Chem.E.

During the past two years, increased public attention has been directed to the subject of solid smokeless fuels. In the present contribution it is the intention to summarize the information presented and the views expressed at two conferences on this subject, arranged by the Chemical Engineering Group of the Society of the Chemical Industry (in association with the Institution of Chemical Engineers, the Institution of Gas Engineers, and the Coke Oven Managers' Association). These two conferences, together with the information derived from the papers submitted in the Coke Competition organized by the "GAS JOURNAL," have considerably added to the present knowledge relating to solid smokeless fuel, and make it possible to obtain a clearer picture of the present position.

It may be desirable at the outset to trace the steps which led to these two conferences. In November, 1924, the Smoke Abatement Society of Great Britain organized an exhibition at Manchester. At this exhibition practical demonstrations were given of various types of solid smokeless fuels produced by high and low temperature methods. From the point of view of the gas industry an exhibit of outstanding importance was the demonstration on one of the stands in which ordinary dry suitably graded gas-works coke was shown burning in an open fireplace of the semi-well grate type. This fire received much favourable comment, and came rather as a surprise to those who considered that in some low-temperature process lay the only future supply of solid smokeless fuel.

The editor of the "GAS JOURNAL," in comment on this exhibit, wrote: "The incandescence of that fire, and its high radiant effect, astounded those people who have been brought up in the belief that gas coke cannot burn properly. The fire also attested that gas coke does not produce any smoke whatever to pollute the atmosphere. Gas coke will burn rightly enough when properly prepared and graded for the purpose at the gas-works."

During the spring of 1925, the Southern Association of Gas Engineers and Managers organized for their members a demonstration and two lectures on coke as a solid smokeless fuel at Tonbridge. This demonstration created wide interest, and was attended by gas engineers and by the general public. The demonstration took the form of the practical use of coke as a solid smokeless fuel in the home. Two open fires of the semi-well grate type, a closed anthracite type stove, and a small coke-fired hot-water boiler complete with hot-water radiator, were all shown burning suitably-graded dry coke.

Shortly after this demonstration it was decided that the subject of solid smokeless fuel was of such importance and was receiving so much quasi-scientific attention that some recognized technical society should take up the matter and discuss the available information. A small Committee was therefore formed to arrange a conference on the subject of solid smokeless fuel on behalf of the Chemical Engineering Group of the Society of Chemical Industry. The Committee consisted of Dr. C. H. Lander (Director of Fuel Research), Mr. C. S. Garland (Chairman of the Chemical Engineering Group), Mr. W. J. U. Woolcock (President of the Society of Chemical Industry), Mr. H. Talbot (Hon. Secretary of the Chemical Engineering Group), and the writer.

THE LEEDS SYMPOSIUM.

The outcome of the work of this Committee was the symposium on solid smokeless fuel held at Leeds on July 16, 1925. Sir Arthur Duckham, President of the Institution of Chemical Engineers, presided, and was supported by Dr. C. L. Reese, President of the American Institute of Chemical Engineers, Mr. Woolcock, and Prof. J. W. Cobb, C.B.E., Livesey Professor of Fuel Technology in Leeds University. There was an attendance of over 300, comprising members of the Society, members of the British and American Chemical Engineering Institutions, prominent gas managers, coke-oven managers, and others interested in the smokeless fuel problem. On this occasion a demonstration of the practical utilization of solid smokeless fuel was arranged in conjunction with Mr. C. S. Shapley, General Manager of the Leeds Corporation Gas Department. Two fires were shown, one burning dry graded gas coke in a semi-well type grate, and one burning fuel which could be classed as patent fuel, made in order to give characteristics of low-temperature coke, though actually prepared at high temperatures. There was also shown a coke-fired hot-water boiler, to which had been attached a radiator and hot-water system.

At the Leeds symposium three representative contributions were made:

1. "Smokeless fuel: the present position and future possibilities," by C. H. Lander, D.Sc., Director of Fuel Research, and Margaret Fishenden, D.Sc., F.Inst.P.
2. "Solid smokeless fuels: their properties and uses," by Edgar C. Evans (National Federation of Iron and Steel Manufacturers).
3. "A study of tars and oils obtained from coal," by F. S. Sinnatt and J. G. King.

At the conclusion of the two papers on solid smokeless fuel, a discussion took place, but it soon became apparent that the time allotted was insufficient to give the opportunity of adequate treatment. The discussion of the tar paper was even less adequate. The suggestion was therefore made that further opportunities should be given for the discussion of these papers.

The Committee previously referred to were therefore asked to make arrangements for a further conference on smokeless fuel.

It was decided to leave the important subject of tar for a separate conference.

THE SHEFFIELD CONFERENCE.

A further conference on solid smokeless fuel was held in the Mappin Hall of the Sheffield University on Friday, Nov. 20, under the joint auspices of the Society of Chemical Industry (Chemical Engineering Group and Yorkshire Section), the Institution of Chemical Engineers, the Institution of Gas Engineers, and the Midland Institute of Mining Engineers. Since the Leeds Conference, the information relating to solid smokeless fuel had been enhanced by the publication of the winning papers in the Coke Competition organized by the "GAS JOURNAL," which papers, together with the papers by Dr. Lander and Mr. E. C. Evans, presented at the Leeds Symposium, formed the subject-matter for discussion.

Sir Frederick Nathan, President of the Institution of Chemical Engineers, presided, and was supported by Sir Arthur Balfour, Profs. Ripper and Wheeler, of Sheffield University, and others.

Arrangements on this occasion were made for each aspect of the subject to be briefly introduced by some speaker, after which there was a discussion on each section.

A demonstration of the burning of suitably-graded dry coke as a solid smokeless fuel was again given by arrangement with Mr. R. Halkett, Engineer and General Manager of the Sheffield Gas Company.

The Organizing Committee ruled that the Sheffield Conference should confine its discussions to the production and utilization of a satisfactory smokeless fuel by proved high-temperature processes. It was made clear to the conference that if the Organizing Committee received a substantial demand for a further conference on low-temperature carbonization, such a meeting would be arranged. It may be stated that, apart from one or two letters which have appeared in the Technical Press, there has been no such demand, and the suggestion for a symposium on low-temperature carbonization is left in abeyence.

The success which attended these conferences led to the general expression of the opinion that co-operation of those interested in the technical and economic aspects of fuel utilization should be continued and become permanent. As the outcome of this feeling, the Fuel Section of the Society of Chemical Industry has been started to continue the work of this Joint Committee. The first big conference of the Fuel Section will be on tar, and is due to take place on Nov. 26. It will give an opportunity for a full discussion on the paper presented by Messrs. Sinnatt and King at the Leeds Conference.

SOLID SMOKELESS FUEL.

In 1924 the total home consumption of coal amounted to some 180 million tons. Of this quantity not more than 20 p.ct. was subjected to such pre-treatment as would render the solid product smokeless. Approximately 90 million tons of raw coal per annum are used for steam raising and other industrial purposes, and 40 million tons are employed for domestic purposes. On the whole, the industrial uses of coal are more efficient and less harmful as regards atmospheric pollution than the domestic uses. It is therefore towards the substitution of solid smokeless fuel for these 40 million tons of domestic coal that these discussions are directed.

Smokeless fuels come under two heads—natural fuels and carbonized fuels. Of the natural smokeless fuels, anthracite is the most important. Approximately 5 million tons of anthracite are mined per annum in this country; the greater part of which is broken and sized. E. C. Evans showed in his paper that close sizing has proved imperative to make it marketable; and ten or eleven sizes are sold at the present time. It is significant that anthracite collieries were working full time, and making reasonable profits, when the coal industry was passing through a most severe depression before the coal strike. It is not a question of price, as anthracite is a most expensive fuel, due to the high mining costs. The advantages in the use of anthracite which counterbalance this increased cost are:

1. Its purity.
2. Its smokeless character.
3. Its high apparent specific gravity.
4. Its uniformity of size.
5. Its hardness.

Apart from anthracite for the supply of smokeless fuel, some process of carbonization is necessary. There are three possible methods of coal carbonization:

1. The gas-works process as at present carried out in horizontal or vertical retorts, at temperatures in the neighbourhood of 1000° C. For this process some 16 to 18 million tons of coal are used every year.
2. The coke-oven process, as carried out in recovery ovens at temperatures in the neighbourhood of about 1000° C. The amount of coal carbonized in ovens is approximately 19 million tons.
3. The low-temperature process of carbonization, in which temperatures much lower than those in the gas-works or coke-oven methods are used. The amount of coal carbonized by low-temperature processes is inconsiderable.

The choice as to the most suitable method of carbonization to supply the nation's requirements of solid smokeless fuel resolves itself largely into one of economics. Dr. Lander in his paper suggests that the success of a carbonization process as a commercial enterprise is governed by four main factors:

1. There must be ample supplies of suitable raw material available.
2. The plant must be assured of a reasonable life, and must be under the control of an experienced and scientific staff.
3. The products of distillation must be in a marketable form, either for the direct use of consumers, or as the raw material of other industries.
4. The commercial value of the products after retorting must admit of a reasonable margin of profit after meeting the working costs and manufacturing expenses, including the depreciation and renewal of the plant.

The normal gas-works practice has been long established, and represents a capital of some £165,000,000. The very fact of its sound position and commercial prosperity is sufficient indication that the necessary factors for success have been complied with. At the present time the only proved economic process for the production of solid smokeless fuel, other than metallurgical coke, is that of the gas-works, which utilizes high temperatures of carbonization.

Respecting low-temperature carbonization, Dr. Lander states that, though a supply of suitable raw material is available, and though the type of plant in which the process can be carried out is yet in the experimental stage, it is as regards the practical utilization of the products resulting from low-temperature carbonization of coal, and as regards the economics of the scheme, that the position is untested and uncertain.

To quote his words: "The economic stabilization of low-temperature carbonization is thus dependent upon the establishment of such markets for the coke, oil, and gas as may give a suitable return for their special properties; and until the products from full-scale installations have become available, and have been disposed of in a free market at such prices as may render the enterprise a commercial success, taking account of the depreciation and renewal of the plant, the economic position of undertakings using low-temperature methods must be regarded as uncertain and to a large degree speculative in character."

Mr. E. C. Evans, in his paper, states that the financial returns from low-temperature carbonization cannot be expected to equal those of high-temperature practice unless a considerably increased price is obtainable for the fuel.

Whatever may be the ultimate future of low-temperature processes, the fact therefore stands out that it is to the existing financially sound high-temperature methods that we must look for immediate supplies of solid smokeless fuel.

At the second conference on solid smokeless fuel, the subject of low-temperature carbonization was ruled out, all the attention being concentrated on a consideration of the requirements of a solid smokeless fuel and a study of the improvements which could be effected in the supply of such material in existing or improved high-temperature plants.

REQUIREMENTS OF SOLID SMOKELESS FUEL.

In stating the requirements of a solid smokeless fuel, there was almost complete agreement between the various contributions. Collating the views expressed, the requirements may be summarized as follows:

1. *Pre-Treatment to render smokeless.*—The fuel must have been previously treated for the recovery of valuable bye-products from raw coal, and so rendered smokeless.
2. *Ease of ignition and combustion.*—It must *either* contain sufficient volatile matter—say 7 to 10 p.ct.—*or* be of such a structure as to be easily kindled and kept alight in open fireplaces as at present constructed.
3. *Low ash content.*—It must have a relatively low ash content, partly to prevent an undue reduction in its calorific value, and partly to reduce the dust resultant upon combustion in household fires.
4. *Strength.*—It must not be so friable as to break easily during handling and transport.
5. *Compactness.*—It must be compact, but not of such a structure that the ash formed during combustion covers the surface of the fuel and hinders combustion.
6. *Price.*—Its price must be sufficiently low, so that when the other advantages are taken into account it will attract purchasers away from bituminous coal.
7. *Low moisture content.*—It must be low in moisture to prevent a large amount of the heat in the fuel being used in driving off the moisture, and to avoid a loss in radiating efficiency.
8. *Grading.*—It must be suitably graded for the purpose to which it is to be put.

PRESENT USES OF COKE.

E. C. Evans states that approximately 7½ million tons of gas-works coke were sold in 1924, the chief uses being:

1. Industrial purposes, steam raising, motor traction, &c.
2. Central heating.
3. As a domestic fuel in open grates, closed stoves, and domestic boilers.

Under suitable conditions, gas coke is a good fuel for boiler purposes, either alone or with coal, as in such systems as the "Sandwich." Coke breeze can also be successfully burnt in chain grate stokers. Gas coke, if low in ash and moisture, is a good domestic fuel. Dr. Margaret Fishenden, in her researches in domestic heating, has shown that the radiant efficiency of dried coke is 24½ and 28½ p.ct. as compared with 21 and 24 p.ct. for coal burnt in the same grates; but this was seriously reduced as the moisture content of the coke increased.

E. C. Evans also shows the interesting fact that over 1,000,000 tons of small bye-product coke could be made available for domestic uses without affecting the net fuel consumption in the blast furnace. Such coke is now largely used in Canada, and, provided it is suitably low in ash and moisture, is a satisfactory domestic fuel. In his paper he gives the ways in which he considers that gas-works coke falls short of an ideal smokeless fuel:

1. Its high moisture content increases the difficulty of ignition, and reduces its radiating efficiency.
2. It has very frequently a high ash content.
3. Gas coke does not burn readily in open grates.
4. Gas coke is frequently sold ungraded.
5. Gas coke "smells of sulphur."

A low moisture content, a low ash content, and suitable grading are capable of comparatively easy remedy, and Evans considers that ease of ignition and the elimination of smell can be obtained by increasing the reactivity of coke.

The demonstrations at Manchester, Tonbridge, Leeds, and Sheffield showed that gas-works coke, when suitably graded, of low ash and moisture content, could be utilized as a satisfactory solid smokeless fuel, and there appears little doubt that the gas industry as a whole has not paid sufficient attention to the production of a coke of the most suitable form for domestic use.

Gas undertakings vary in the care they have taken in coke production, and it is found that those companies which pay due regard to supplying their customers with a dry graded coke usually have little trouble in disposing of their products. Experience at Manchester, Sheffield, and Birmingham showed that the demonstration of the uses to which coke could be put in the house rapidly led to an extension in its use. Thus, though gas-works coke may not be an ideal smokeless fuel, yet its uses are rapidly expanding. There is much room for improvement, and the conferences contributed much information towards realizing the ideal.

For clearness, the opinions of the conference on the various desirable qualities of a satisfactory smokeless fuel will be discussed separately.

Ease of Ignition and Combustibility.

In the preparation of an easily ignitible and combustible fuel, it is of prime importance from the economic point of view to decide whether 7 to 10 p.ct. of volatile matter is to be left in the coke, or whether coke with low volatile matter, but of suitable physical form, can satisfactorily fulfil the requirements. Coke with 7 to 10 p.ct. volatile matter does not necessarily involve the use of low-temperature processes, for, as E. V. Evans, John Roberts, and others have shown, this can be obtained by suitably blending and carbonizing the coal in existing high-temperature plants. But the effect of leaving 7 to 10 p.ct. volatile matter in the coke renders it a more expensive product. E. V. Evans states that 9·3 p.ct. of volatile matter in the coke represents about 29 therms per ton of the original coal. E. C. Evans gives, in his paper, a careful study of the ways in which coke reactivity may be increased. Some difficulty has been experienced in determining a satisfactory comparison between the reactivity of various cokes. As the result of joint investigation between the Fuel Research Board and the National Federation of Iron and Steel Manufacturers, a method has been devised depending upon the passing of a standard volume of carbon dioxide at a standard rate over a standard volume of coke of special grading heated to 950° C., and the reactivity measured by the volume of carbon monoxide produced. Such a method gives concordant results with the same coke, and comparative results with different cokes.

E. V. Evans, in discussing the danger which lies in determining the value of a household fuel by means of reactivity tests, gave details of a test devised by him which he has found of considerable value. The principle involved is that air is pulled downwards at a definite rate through a bed of fuel of uniform size, and the ease of combustion is represented by the rate at which the incandescent zone travels across the bed.

The methods of testing reactivity and the relation of reactivity to ease of ignition and combustion must remain a subject of further work; but the evidence and opinions of the various papers gave agreement along certain fundamental lines. By the alteration of its physical form, coke can be made more easily ignitible and more combustible. Improved results are obtained when the structure of the coke consists of a large number of small cells with thin non-graphitic walls. In order to obtain such a structure, it is necessary—

1. To eliminate the plastic layer.
2. To carbonize rapidly.

These two factors are inter-related. The elimination or reduction in the amount of plastic layer enables a more rapid transmission of heat to take place into the charge.

In order to satisfy these two requirements, it is necessary to blend the coal; and the suggestions relating to coal blending form probably the most outstanding features in the papers discussed. Upon the value of blending there was complete agreement. In brief, the object of blending is to satisfy the excess binding properties of the coal being carbonized by the introduction of some material with a deficit in binding properties, and thus prevent the formation of large cells, forming instead a hard coke with a large number of small cells.

The work of Sutcliffe and E. C. Evans on the carbonization of briquettes made from blended coals without the use of a binder was followed up by similar work by E. V. Evans, published in the Cantor Lectures. Subsequently, work on the carbonization of blended coals in continuous vertical retorts has been carried out, results of which were mentioned in the winning paper of the Coke Competition, Section I., and by Hollings and Rhead at the Sheffield Symposium.

All these workers find:

1. That when caking coal is suitably blended with non-caking coal or coke dust, a more rapid rate of carbonization is obtained.
2. That the resulting product is more combustible.
3. That the resulting product is harder.

The importance of blending is far-reaching, for, apart from improving the quality of the coke, it tends to increase the output of material from the plant, and also renders available for carbonization purposes large quantities of coal hitherto regarded as unusable. There is, therefore, much evidence that the development of high-temperature carbonization processes, coupled with the blending of the coal being treated, should lead to a much improved solid fuel. As Dr. Lander says: "Cokes of high porosity and thin non-graphitic cell wall structure, if reasonably free from moisture and ash, and properly screened, should find a rapidly increasing outlet for household use." The process of blending is also applicable to the production of a solid smokeless fuel containing 3 to 8 p.ct. volatile matter. John Roberts stated that, if a suitably-blended coal be charged into a 14-in. oven working with high combustion chamber temperatures, and the oven pushed when the centre of the charge has reached 600° C., a good smokeless fuel is obtainable, and, moreover, it is possible to push the charge in two-thirds the usual coking time.

Low Ash Content.

The average ash content in gas-works coke has steadily increased during past years, and there is no doubt that one of the main objections to coke is due to the high ash content. Ash tends to inhibit ignition and combustion of the coke. E. C. Evans considers that 10 p.ct. of ash is probably a good deal lower than the average in this country, and urges that gas companies should adopt some coal-cleaning process. Dry cleaning of coal is now an established method in America. R. Lessing has shown that the carriage of mineral matter in the form of coal ash forms the second largest of any class of material carried by the railways.

The ash content plays an important part affecting the strength of the coke, forming planes of weakness. The effect of grinding will be to distribute the ash throughout the coal, and in this form it is not so liable to clinker and cause the fire to go dead; but, on the other hand, it tends to give a false idea of the amount of ash present. Washing of coal to remove ash has up till recently been associated with the disadvantages of charging wet coal to the retorts; but the development of recent methods of coal drying in continuous centrifuges, giving a final moisture content in the coal of 5 to 6 p.ct., helps to solve the problem of increasing the supply of clean coal.

Dryness of Coke.

Efficient quenching is a *sine qua non* in the successful exploitation of a domestic fuel. D. Rider, in his contribution to the subject, points out the futility of spending thousands of pounds on research, and many more thousands on the production of the ideal smokeless fuel, if it be deadened because of its high water content. The uncertainty associated with the use of gas-works coke as a domestic fuel is largely due to lack of system in quenching. In carbonizing plants of the intermittent type careful regulation of the amount of water used should be enforced, if water quenching is resorted to. In continuous vertical retorts quenching is effectively carried out by steam introduced at the bottom of the retort, the heat of the coke being economically used in the water gas reaction.

To eliminate the use of water in the quenching of coke from intermittent carbonization plants, processes for the dry quenching of coke have been devised. In such a system hot coke is transferred to an airtight chamber, and is cooled by passing inert gases through it. The gas in turn is cooled by the transference of heat to a boiler plant before being returned to

the coke chamber. Mr. Rider sums up the position concerning quenching methods as follows:

1. That liquor quenching should be abandoned.
2. That steam quenching will depend upon whether continuous verticals are obtained suitable for producing the fuel required.
3. That local conditions and requirements will determine whether water quenching is most suitable.
4. That if water quenching is adopted the quenching tower system placed away from the carbonizing plant will probably be the most suitable.
5. That the coke car and loco is probably the cheapest and most satisfactory means of conveying the coke to the tower.
6. That if dry coke cooling is employed there must be an outlet for all the steam thus produced.
7. Dry coke cooling will not be satisfactory unless the temperature of the inert gases going to the boiler is constant, and the quantity of steam produced is uniform throughout the day.

Strength and Compactness.

The ideal smokeless fuel should be sufficiently strong to withstand normal transport and handling. It usually follows that the coke with the greater degree of compactness withstands handling with less breakage, while at the same time a compact fuel has the important advantage of allowing a greater quantity to be stored per cubic foot of space. The blending of coals with the elimination of the plastic zone gives a particularly compact coke, which has high powers of resisting abrasion. The popularity of anthracite as a smokeless fuel is especially due to its good qualities in these two directions. A purchaser of anthracite knows that the material he receives will not get broken up on storage or handling; but the same cannot be said to apply to coke, and developments which tend to improve coke strength are valuable.

Coke Grading.

The subject of coke grading requires standardization. E. C. Evans suggests that the standard grading adopted by the London Coke Committee might very well be adopted for general use.

1. *Large coke* remains on a 2-in. screen.
2. *Domestic coke,* through 2-in. and remaining on ¾-in. screen.
3. *Coke nuts,* through ¾-in. and remaining on ⅜-in. screen.
4. *Coke breeze,* ⅜-in. to o-in.

Many gas undertakings have not given the grading of coke the care it demands. The second section of the Coke Competition covered the subject of coke preparation; and valuable information was given in the two winning papers by F. M. Birks and R. V. Stockwell on modern methods of handling, grading, and breaking coke. R. Halkett, in describing the plant at Sheffield, stated that by suitably grading his coke he greatly increased his domestic market.

The fundamental considerations in design of coke handling and screening plant may be summarized as follows:

1. Screening plants should be designed to have an ample capacity for their work, and care should be taken to instal them well up to the highest peak likely to be obtained. Screening plants driven to their maximum capacity usually tend to give excessive wear and tear.
2. A satisfactory screen must comply with two essential conditions.
   (*a*) It must lift each individual piece of coke apart from its neighbours.
   (*b*) It must present each particle to a pre-determined gauge in two dimensions through which the undersized pieces can pass without obstruction.
3. For rough screening, rotary grizzlies are satisfactory; for fine screening, shaking screens give good classification.
4. Coke should be carried, and not dragged, wherever possible, to lessen breakage.
5. Coke is an abrasive and corrosive material, and where possible cast iron and india-rubber should be used, as they resist both abrasion and corrosion better than mild steel.

This summary on the papers and discussions on solid smokeless fuel would not be complete without reference to the uses of coke as a domestic fuel. The subject was dealt with in the third section of the Coke Competition in the winning papers by F. H. Arms, E. W. L. Nicol, and F. W. Smelts. Arms gives an interesting summary of the uses to which various grades of coke are put, which may be summarized as follows:

Large coke, over 2 in. mesh, used for all branches of metal trade, where a fierce heat is required for melting purposes, and also for glass blowers, bakers' ovens, steam lorries, boiler makers. This grade of coke is also most suitable for large type heating apparatus for public buildings and theatres. Large coke is also used extensively as fuel on river and canal steamers.

Small coke, 2 in. to 1¼ in., is the domestic or household size, and burns well in an ordinary grate. It is an ideal fuel for the old-fashioned range and hot water supply.

Inch breeze, 1¼ in. to ¾ in., is the size used by smithies, welders, &c., for use on hearths. It is very suitable for anthracite stoves. A stove well filled with such breeze will last eight or nine hours, and shows a considerable saving compared with anthracite.

Bean breeze, ¾ in. to $\frac{7}{16}$ in., is in general use for smiths' hearths and all smaller types of forgings. Building contractors employ this material in the making of concrete floors.

Rough dust, through $\frac{7}{16}$ in., is consumed in chain grate boilers.

This grading of coke varies somewhat from the grading of the London Coke Committee, but the main difference is the division of domestic coke into two grades—small coke and inch breeze. F. H. Arms and E. W. L. Nicol both consider that coke produced from continuous vertical retorts, when suitably graded, has special qualities which render it particularly fitted for use as a domestic fuel. E. W. L. Nicol states: "The most remunerative market for coke brings it into direct competition and comparison with house or parlour coal, as used extensively in open firegrates. Vertical coke unquestionably gives results, especially in firegrates of the older type, which are unattainable with denser kinds of horizontal coke burned under the same conditions. Comparatively light and uniformly dry vertical coke gives quicker ignition and freer combustibility."

It is an interesting fact to record that the undertakings which have made the most progress in the development of a domestic coke market are building up the market on this type of coke. This is undoubtedly due to suitable grading and low moisture content.

In conclusion, the present position as regards solid smokeless fuel may be summarized as follows:

1. There is an immediate demand for a supply of solid smokeless fuel for domestic purposes.
2. For this supply to meet with success, the solid smokeless fuel:
   (i.) Must be sold on a competitive basis with house coal.
   (ii.) Must be combustible and easily ignitible.
   (iii.) Must not cause the user extra trouble with ash or smell.
3. The supply of smokeless fuel may be obtained by various processes, according to local conditions; but it appears likely that the already established gas and coking industries will be the suppliers of the bulk of it, whether by high or by low-temperature processes.
4. At the present time low-temperature processes are both technically and economically unproven.
5. A supply of satisfactory solid smokeless fuel can be obtained from the gas and coking industries in already existing plants if adequate attention is paid to the following points:
   (*a*) The coke must be dry.
   (*b*) The coke must be suitably graded.
   (*c*) The coke must have a reasonably low ash content.
6. Dry coke can be obtained by one of three ways:
   (*a*) In intermittent processes of carbonization by carefully limiting the amount of water used.
   (*b*) In intermittent processes by quenching the coke with inert gases, recovering the heat therefrom as steam.
   (*c*) In continuous processes by quenching the coke in the retort with steam.
7. The grading of coke merits close attention. Standardization of coke grades is recommended.
8. In order to have coke with low ash content, some process of coal cleaning, either by dry methods or by washing, followed by drying the coal, is frequently involved.
9. The product of high-temperature carbonization processes can be further improved by altering the physical form of the coke. The fundamental basis of this improvement is to obtain a coke with a structure consisting of a large number of small cells with thin non-graphitic walls. This can best be accomplished by suitable blending.
10. Blending of coal has the following advantages:
    (*a*) It makes the solid product resulting from carbonization more combustible and more easily ignitible.
    (*b*) It gives a more compact fuel.
    (*c*) It renders available as potential solid smokeless fuel material otherwise unsuitable.
    (*d*) If ultimately found desirable, a satisfactory solid product containing 3 to 8 p.ct. of volatile matter can be obtained in high-temperature carbonizing plants by suitable blending.

I have pleasure in acknowledging the assistance I have received from Mr. T. C. Finlayson, M.Sc., A.M.I.Chem.E., in the preparation of this summary.

Discussion.

Prof. H. E. Armstrong, F.R.S., suggested that this meeting and the two previous meetings at Leeds and Sheffield had been held entirely in the interests of the gas companies. What this country

needed was a complete and full discussion of the problem of the future of coal, not of coke.

NEED FOR FUNDAMENTAL RESEARCH.

Mr. HARALD NIELSEN said he was pleased to note that in the résumé given by Dr. Smith something was said about the need for getting rid of the graphitic film—a point he had raised at Sheffield. It was curious that, in all these discussions on solid smokeless fuels, people always talked about volatile matter, and suggested that the fuel must contain 7 to 10 p.ct. of volatile matter in order to burn easily. He had found that the question of volatile matter did not enter into the picture at all. Even if the quantity was down to 2 or 3 p.ct., provided the structure of the fuel was right, it was possible to ignite a solid smokeless fuel with a piece of paper. It was necessary to consider the possibilities of improving coke; and they should undertake some fundamental research on what formed coke, somewhat on the lines laid down by Prof. Bone when he spoke about his benzene extracts. There was a lot of talk about blending coal. This was all very well, but blending cost money, and he was convinced that by the scientific treatment of coal it should be possible to isolate the coke-forming constituents and make a good coke or a good smokeless fuel from any coal, whether coking or non-coking.

DR. LANDER'S VIEWS.

Dr. C. H. LANDER (Director of the Fuel Research Board) said that the papers of which a summary had been given were now about twelve months old, and a certain amount of water had flowed down the Thames since then. There were therefore one or two points of interest, first of all on the high-temperature side, which he would like to put forward in a very tentative manner. Many of them had had the opportunity of seeing the Fuel Research Station at Greenwich, and the work that was going on there on both the low-temperature and high-temperature sides. Since writing the paper for the Leeds meeting, a certain amount of experimental work had been done with a view to the production of a more free-burning coke from the existing vertical retorts. These happened to be, of course, by a certain maker—not Dr. Smith's firm—but he considered that the results were applicable, and they were trying to make them applicable, to various types. What they had really been doing was to resuscitate something which was done many years ago in London by the Gas Light and Coke Company, who put on the market a fuel called "Carbo," produced by giving short charges to the horizontal retorts, and not running them to the full coking time. It seemed to those at the Fuel Research Station that it was worth while, perhaps, exploring that method a little bit further; and it also seemed that vertical retorts presented features which were not presented by horizontal retorts in the production of a freer burning fuel. These experiments had been proceeding steadily, but, of course, very slowly, because it took a long time to get results in this way. But what they had been doing was to increase the throughput of these retorts. They started with the normal rated throughput of each retort of 2·5 tons, and ran up the throughput until such time as they got raw coal coming through the centre. The fuel obtained was more smokeless than coal, but it did not possess the advantages of low-temperature coke. By doubling the output and getting about 5 tons through, he obtained results which he would put forward tentatively. Whereas the normal throughput from the retort was 2·5 tons, in the tests they got 5·02 tons. The gas yield, of course, came down; it fell from 97 therms per ton to 68 therms per ton. But he was not sure that they were always correct in reducing the economics of gas-works processes to a tonnage basis. In some circumstances it might be more sound to reduce it to a cost-of-production basis. Though the yield per ton coming from the retorts was cut down, the make per retort per day had gone up from 244 therms to 342 therms—an increase of 40 p.ct. The calorific value had gone up from 469 to 570 B.Th.U., and the specific gravity had come down slightly; but that was not a very important point unless it referred to an undertaking which had a high declared calorific value, when a small change in specific gravity might cause trouble in the burners. He was, however, subject to correction in that statement, and did not make it in any way in a pedantic manner. The other figure from the test was tar; and the production of tar ran up from 13·35 gallons to 15·8 gallons per ton—an increase of 18 p.ct. Sulphate went up slightly. The carbonizing temperature—or rather the temperature they worked to, which was held very correctly in the setting—was 1260°. Of course, one note of caution was necessary in regard to this work—namely, that the retorts at the Fuel Research Station having been designed for experimental purposes, it was possible to pour into the chambers practically as much heat as desired, so that there was no difficulty in maintaining these temperatures, even if the throughput was double. In fact, they did not get into any difficulty at all with the retorts until the throughput trebled; and such need not necessarily always be the case. An interesting figure was the fuel gas per therm of coal gas made, and here the higher throughput showed a decrease of 11 p.ct.—namely, 0·42 therm of fuel gas was reduced to 0·37 therm. He gave these figures for what they were worth, in a tentative manner. They might be subjected to severe criticisms; but this aspect of the matter had not been resuscitated—he was open to correction—since the time when, for definite economic reasons, which were stated ably by Mr. Milne Watson in his evidence before the Royal Commission, the Gas Light and Coke Company abandoned that method of making "Carbo."

LOW-TEMPERATURE CARBONIZATION.

He understood that the subject of low-temperature carbonization was not to be left out of this discussion; and there were one or two points he would like to make in this connection. In Dr. Smith's paper there were abstracts from his own paper in which certain conclusions were given with regard to low-temperature carbonization, perhaps some naturally cautious conclusions; but, again, things had occurred since then. In the first place, one of the statements made there was with regard to the present economic position of low-temperature carbonization. It was necessary to be very careful about this, and at the same time it was necessary to hold the balance between the wild extremists who said the whole thing was done, and had been done years ago, and those who said absolutely that it never had been, and never could be, done. The Coal Commission had considered that question very carefully, and took evidence from both sides; and he did not think he was "telling tales out of school" when he said that the Coal Commission had made a very exhaustive examination of the subject, and afforded everybody an opportunity to state their views—not necessarily orally (because, if they had started that, the inquiry would have gone on for the next hundred years), but in writing—and very many statements were received as a result. The Royal Commission stated the position in these words: "We have given close attention to this question of low-temperature carbonization; but we can find no evidence that the system has yet been anywhere established on a commercial scale for a period sufficiently long to enable the claims that are made on its behalf to be fully tested." After that, however, the Commission went on to adopt a rather optimistic note. He, personally, was a distinct optimist in this matter, and always had been. As he saw the position, it was that in the natural development which must always occur in a chemical process, and in many engineering processes, from purely laboratory stage to final commercial operation, four stages must be gone through. Sometimes a stage was jumped, but if so it was a pure gamble; it might come off, or it might not. The stages were, roughly, the laboratory stage of doing the job with a few grammes or thereabouts. In low-temperature carbonization that stage, of course, had been passed years ago. The next stage was the intermediate stage of doing it with a few pounds. Usually the object of the promoters at that stage was to get data from which they could design a unit-scale plant. Having done that, and overcome the usual difficulties with a unit-scale plant, they finally arrived at a stage at which they had a plant capable of dealing, perhaps, with 10 tons a day, and in some cases 50 tons a day—it all depended on the type of process. That stage, however, could not possibly prove the commercial possibilities of a process. It gave certain data to go upon; but in the case of a radically new process, in which one did not know what the financial value of the oils was going to be—if the market was flooded, for example—it was necessary to go through what might almost be called the commercial experiment stage, with an actual plant having a capacity of 200, 500, or 1000 tons a day, and to run that for two, three, and sometimes more years. Then a balance-sheet could be got out by accountants, and the position was definitely known. He believed the end of stage three had been reached in several cases. There were plants which he had no hesitation in saying ought to be tried-out. They ought to be given every chance on a much larger scale, and under the most favourable conditions. It must be remembered that every coal-field differed, and many gas-works differed, and the commercial prospects of a scheme could never be judged by generalization. The ordinary balance-sheet showing 10s. a ton profit for low-temperature carbonization was of very little use, because another person could draw up a balance-sheet for another purpose showing 10s. a ton loss. It was necessary to know the site where their plant was to be erected, what the markets were likely to be, and the whole of the conditions, before an opinion could be expressed. Personally, he did not consider himself competent to criticize a scheme even when it got to that stage. This, as he saw it, was the present position of low-temperature carbonization. In this connection, the work being done at the Fuel Research Station was very promising. Plant of a certain type had a throughput of 8 tons a day, and the experimental work had been going on continuously for 24 hours a day for nearly four years. He held no brief, however, for that plant. It was merely an exploration, a research on a rather large scale on a type of plant which was deliberately selected because nobody was exploring in that direction. The work at Greenwich had been carefully done, so as not to queer anybody's pitch. One of the great difficulties of low-temperature carbonization was past history. Statements had been made regarding the "promised land" which had never been reached, and naturally people were getting rather shy of some of these schemes. That, however, was not the fault of the many earnest and genuine workers who were on the job at the present time. Indeed, they were to be commiserated with for it. On that account, some eighteen months ago the Government directly empowered the division of the Department which was in his charge to offer to test, free of charge, any plant which afforded a certain amount of promise. They did not offer to test free of charge and issue a balance-sheet on a laboratory scale plant or a few pounds plant, but the idea was to see whether stage three had really been reached, and to make the figures obtained available to the public. Every care was taken, and all checks were applied, so that the accuracy of the results should be of the highest possible order. They were extremely disappointed at Greenwich if they did not get a weight balance with less than 1 p.ct. error on a 10 to 20 ton scale plant. This was regarded as the ultimate permissible error in the work at Greenwich; and up to the present, in the four plants that had been tested, they had got practically that degree of accuracy. Reports on two of them had already been published, and the other two were in the press.

NEED FOR CLEANER COAL.

Mr. H. J. HODSMAN dealt with the effect of ash on what he called the radiant efficiency of carbonized fuel. He had carried out some experimental work in this connection recently; and as a result of this, he had come to the conclusion that it had a considerable effect on the worth of the fuel in the open grate, and was inclined to say it was a most important factor. It was widely believed that, when a fuel was carbonized at a low temperature, the radiant efficiency was considerably increased; but so far as his own experiments went, they had not supported this conclusion. It seemed that the reduction of ash content would have a much more pronounced effect in that direction. Last year, before the Institution of Gas Engineers, a paper was presented by Messrs. Marson and Cobb on the result of the addition of inorganic substances to coal on the nature of the coke produced; and it was shown, from careful laboratory experiments, that, so far as the eye and certain physical tests were concerned, the effect of the addi-

tion of certain substances—particularly oxide of iron and carbonate of soda—was to produce a coke which largely "filled the bill" as detailed by Dr. Smith in his summary that morning. Since that time this work had been continued, and the further result had come out which showed (judged by all the tests that had been applied—namely, reaction with carbon dioxide and steam and even behaviour in the open fire) that the chemical properties of the coke were improved to a surprising extent. The importance of this would be obvious. What it meant, as he saw it, was that, if they were going to follow out what seemed to be a most alluring prospect at the moment—*i.e.*, the modification of the properties of smokeless fuel in this way—they must bear in mind that the end product must contain a reasonable quantity of incombustible matter. That meant that those who were going to experiment in this direction must be able to assure themselves of a coal with probably only a reasonable ash content. It was particularly interesting at the moment, when the mining industry was in a state of flux and transition, and had frequently to accept advice from any quarter, however little it might know about the industry; and it was important that this sort of thing should be brought to the notice of those concerned. Where church dignitaries ventured, surely the Fuel Section of the Society could venture in their company, by giving advice to the mining industry to the effect that they should increase very considerably the supply of raw material for carbonization sufficiently low in ash content to enable these possibilities to be explored. The fact that the coal would be increased in cost would be counteracted by the extra value of the end product to the consumer; and it would be more than worth while to pay this increased price. What was wanted from the mining industry was cleaner coal.

Who Should Produce Smokeless Fuel?

Mr. Edgar Hill spoke mainly on the question of who would be most suitable for the annual production of the 40 million tons of domestic coke which would be required in the not far distant future. During the last ten years, while endeavouring to the best of his ability to keep abreast of the latest developments in the chemistry and carbonization of coal, and recovery of bye-products, he had had the good fortune to be called upon from time to time to examine critically carbonization schemes and bye-product recovery products. He wished to say emphatically that the best coke he had ever seen suitable for domestic purposes was that produced by low-temperature carbonization. Being essentially an output enthusiast, he would naturally prefer large rapid outputs of suitable coke from a high-temperature retort, than a slow output through a strictly low-temperature process—provided, of course, that the rapid method gave as good a product as that produced by the slower process. For a considerable time he had been of the opinion that the coke oven industry generally was little better fitted, if they desired to supply domestic coke, than the gas industry; and though he sincerely congratulated the gas industry on the research work they were carrying on with the object of producing satisfactory domestic coke, yet he regarded that industry as being unsuited to have the power to tamper with the large supply of domestic coke of this country in the near future. In the prize-winning essay by Dr. Smith, T. Campbell Finlayson, H. M. Spiers, and Frank S. Townend (Coke Competition Number of the "Journal," p. 8), it was stated that "the inevitable conclusion is that, to attain an improvement in the quality of coke produced in gas-works, certain features of existing coke oven practice, and probably new features dictated by latest research, must be incorporated in the existing practice of gas-making." He took it that all the statements in this paper had been carefully considered from all angles. Yet this statement bore out his contention. Again on p. 7, under "Factors Affecting Coke Quality," he read that "the object of the present paper is to study the problem of coke manufacture from the point of view of the gas industry; and though coke is a factor of great importance, the production of gas of suitable quality for economic distribution cannot be sacrificed to produce coke." He heartily agreed with these statements, and believed all those present would agree with him that, when the time came for the carbonization of their domestic fuel, it should not be left in the hands of people whose first mission was to produce gas, or in the hands of oil extractors, but that a new industry should be formed, the sole mission of which would be to produce the best possible fuel for domestic purposes—of course, as economically as possible. In view of contradictory rumours as to certain coking activities in Germany, suitable arrangements were made for him to visit that country last October. When he considered how, on the one hand, the coal industry on the Ruhr was thoroughly organized as to selling, and was carrying out a vigorous policy of scientific research on practical lines, while, on the other hand, the coal industry in Great Britain was disorganized and idle, and the trade of the country was being paralyzed thereby, it made him sick at heart. He suggested that the conference should pass a resolution urging the mine owners and miners to get together without delay, to take the long view in a conciliatory spirit, to settle their differences for the time being, and set about reorganizing the coal industry, both scientifically and economically, on the lines laid down by the Royal Coal Commission, and thereby begin to pull the country round to a period of prosperity and plenty.

Influence of Inorganic Material.

Dr. A. Parker (Leeds University) was of opinion that the advocates of high-temperature carbonization found everything wrong with low-temperature carbonization, and *vice versa*. The fundamentals were being elucidated very slowly by all types of investigators; and what was required was co-operation from all sides to bring out the really valuable information. The Fuel Section, he hoped, would bring about that co-operation. The last speaker had said that a domestic fuel should not be produced by the gas industry. Probably some other speaker would say that it should not be produced by the coke oven industry. In his, the speaker's opinion, they ought to combine in this matter. Solid fuel contained roughly 300 therms per ton, and at 1d. per therm this was worth 25s. In the form of gas, it was worth much more at present; and this was a point which must be remembered in the economics of the process. Also, it should be borne in mind that the passage of heat through coal was not an easy matter; and he thought that more work should be done on internal heating of coal for carbonization, if low-temperature processes were going to be successful. They required uniformity in the product—a fuel which would enable them to retain a fire without having a large body of fuel in the grate. This brought them to the various statements that had been made as to combustibility, reactivity, and ignition temperature. They had been told that small pores and thin cell walls meant greater reactivity in coke—a point of which he had been unable to find any experimental proof. As Mr. Hodsman had said, the work of Prof. Cobb and others at the Leeds University, and of the Gas Research Committee of the Institution of Gas Engineers, had proved definitely that the inorganic constituents of coal had a marked influence on the reactivity of the coke produced as measured by the amount of steam decomposed at a definite temperature—the steam being passed over the coke at a definite rate and at a definite temperature—and it was difficult to decide whether it was the effect of the inorganic constituents which produced the reactivity, or the coal constituent, or whether indirectly the inorganic constituent had altered the cell structure. All these points wanted clearing up; and they would not get much further on this question of combustibility and reactivity until more work on the fundamentals of the subject had been done. The same thing applied in blending coals. Was it the actual blending of the coal substances which had the effect on the coke, or was it simply that the ash constituent of one coal was very different from that of another, and had an effect upon the combustibility of the coke? As regards the test for combustibility, reactivity, and ignition, every test so far brought out required the grading of the coke into definite sizes; and the reason was obvious. One knew from experience that, if a sample of coke was graded into different sizes, the ash content of the different sizes varied considerably. He had found it vary from 20 p.ct. in one size to 8 p.ct. in another, and down to 4 p.ct. in another. It was not a good test of reactivity of a particular grade unless it contained a true average ash content of the whole coke. These points were brought forward to illustrate the precautions which must be taken in detail before they could really draw any reliable conclusions.

Coke in Domestic Ranges.

Dr. Margaret Fishenden said it always appeared to her that one very important condition was consistently overlooked in these discussions on smokeless fuels. The most likely market for them appeared to be the domestic market, and a great deal was heard about the suitability of various improved cokes for burning in domestic grates. These claims were usually made, however, for the open grate, or for central heating, or for independent boilers for hot water supply, whereas there was no doubt that by far the greater proportion of the coal used in houses was in the kitchen range; yet the suitability of coke for the kitchen range was never discussed. In this case, it was not sufficient that coke should ignite easily and burn well; it must, in addition, be able to heat the bath water and the oven satisfactorily. In these respects coke often failed to put up a creditable performance. Perhaps the reason why this matter was not often discussed at such meetings as these was that the failure was not associated altogether with the nature of the coke as fuel, but had a great deal to do with faulty design of the ranges. It was necessary for manufacturers to pay attention to securing ranges that would burn coke efficiently. If the entrance to the flues was low in relation to the fire bed, so that even when a fire had fallen low any air that was drawn into the flues was first drawn through an incandescent layer, there seemed to be no reason why coke should not act well, though the inference from furnace practice, where the aim was to increase the radiation from the flame as compared with the radiation from the hot gases, was that the heating-up might not be so rapid with coke as a fuel as with coal.

Importance of Ash in Coal Utilization.

Dr. R. Lessing said that, though he seldom found himself in agreement with Prof. Armstrong, on this occasion he entirely agreed with the note he had sounded in opening the discussion—viz., that, after all, they should be discussing the fundamentals of coal, and, he would like to add, its behaviour at the high temperatures to which it was submitted either for carbonization purposes, or for producing other products, or when being burned in the raw state. It was essential that this should be realized before the Fuel Section was launched upon its career. The differences which existed, and had brought into existence two factions in favour of one or the other system, should not be encouraged, and, indeed, should be done away with. In the past there had been a similar standing-aloof on the part of the gas industry from the coking industry. He could well remember the time when those in charge of gas-works knew absolutely nothing of what was happening in the coking industry. He hoped this remark would not be taken amiss. They had progressed far since then, however, and to-day the gas industry was using coke oven gas in large and increasing quantities for its own purposes. This might have some significance in regard to the change that had come about, and in regard to the fact that they had now the Coke Oven Managers' Association as a valuable co-operating body in the work of the Fuel Section. The same thing applied to the relationship between those interested in high and in low temperature carbonization. As an investigator of coal and of the carbonization of coal, he did not recognize any difference at all between the two processes on broad lines. The establishment of two camps was not justified, and eventually the same thing would happen as had happened in relation to the gas industry and the coking industry. The two would have to work together. Dr. Lander had given an interesting example of the work being done at Greenwich, where a solid fuel such as it was desired to produce by the low-temperature process had actually been produced by the high-temperature process—at any rate, in a high-temperature plant—so that the question was rather more one of the study of the materials they were dealing with than of the application of the plant

to the materials. It would be accepted as a fact that the great fault with low-temperature carbonization in the past was that the details of design and construction were, if anything, of greater importance than in high-temperature carbonization, for reasons into which he need not enter. He meant that the plant was designed and put up without due regard to the differences in, and the complexity of, the substance to be dealt with—viz., coal—and he urged again that research into the behaviour of coal was the first function of those who really aimed at promoting progress in the industry. During the past few years the question of coal research had made greater strides forward than it had done during the previous twenty or thirty years. They had learned more about coal in the past six or seven years than in the previous generation; and this was a very hopeful sign. There was one question which was still not regarded with sufficient gravity, and that was the one raised by Mr. Hodsman—the question of the cleanliness of coal and the importance of ash in every aspect of coal utilization. The work that was being done at Leeds University confirmed in every respect work that he himself had been doing for fifteen years; and it might be remembered that he had pointed out at Leeds last year the enormous and surprising differences which could be obtained in the carbonization of coal under identical physical and other conditions by small adjustments of the ash content. In order to make such adjustments operative, it was necessary, first, that the bulk of the ash should be removed from the coal; and he was pleased that Mr. Hodsman had actually put in words that the ash should be reduced to something more than a reasonable content. He personally would like to qualify this, and say it should be reduced to less than it was to-day, because he ventured to prophesy—although prophesying was an unsafe pastime—that it would not be many years before they would have altered their ideas of a proper and reasonable ash content in coal. Only when this was done would they be able to obtain the desired results on the lines of fundamental research.

Mr. C. P. FINN (Past President of the Coke Oven Managers' Association) said those in the coke oven industry welcomed the formation of the Fuel Section. They deprecated the splitting-up into two camps of people handling coal; and as men concerned with the utilization of coal at its very source—the mine—they would welcome any system of utilization so long as the most efficient results were obtained.

CONDITIONS IN CANADA.

Dr. L. E. GOODWIN (Queen's University, Canada) remarked that in Canada the conditions were different from what they were in England. Of the 10 or 12 tons of fuel used per annum in Canada for heating a house, not more than 2 tons were used in the kitchen range; and as very few houses there had more than one open fire, the bulk of the fuel was used in the furnaces for central heating. In Canada he could buy good slack, the smaller screenings of bituminous coal of a far higher calorific value, at about the same price as coke; and the point he wished to bring out was why should they be asked to pay 10 dollars (£2) per ton of coke in Canada, when he knew the bituminous coal from which it was made cost the gas-works 16s. per ton, and yet they had had the gas, ammonia, and other bye-products out of the fuel. Until this condition of affairs was remedied, he would not use coke.

MANCHESTER CONFERENCE.

Mr. A. MCCULLOCH (Manchester) extended a hearty welcome to everyone interested to the meeting which is to be held in Manchester in November, when it is hoped to deal with the question of low-temperature tar. In conjunction with the Manchester conference, there will be an exhibition where various types of coal products will be shown, as manufactured by different types of plant. This exhibition will be held in the City Hall.

REPLY TO THE DISCUSSION.

Dr. SMITH, replying to the discussion, said that the low-temperature tar discussion in Manchester, which had been referred to, was being organized by the Fuel Section in conjunction with the Institution of Gas Engineers and the Coke Oven Managers' Association, and would include the whole gamut of tars. The low-temperature carbonization people were being invited to contribute, and would be heartily welcomed; in fact, the tar question would not be complete unless that side was fully considered. Further, there would be a carbonization congress in March next, probably in Birmingham, and the same three bodies were combining to endeavour to make this a success. The Joint Committee which met last week positively agreed that low-temperature carbonization should have a definite and considerable place in that carbonization congress, so that those who were desirous of seeing all parties come together would realize that facilities were being provided. With regard to those speakers who suggested that these conferences had been purely a gas industry boost, he would like to protest against their view. The reason why the subject had been confined to high-temperature industries was because they existed at the present time, and because suitable coke was wanted as soon as possible. If they had to wait until certain industries which might produce a still better material were able to do so, they would have to wait a long time. There were many difficulties, but it was the duty of everyone interested in fuel to help the gas industry and the coking industry to produce a much better product than they had manufactured in the past. The gas industry had 165 millions of capital invested, and it had all the facilities for giving an improved material. It was their duty to see that the best use of this capital was made. The point had been raised in the discussion that the ash content of coal should be reasonably low; and one speaker had suggested that it should be more than reasonably low. He put it to them that the ash content in coke could only be reduced to that extent which made it economically practicable; and if the cost of the operation was to enhance the price to such an extent that people would continue to use coal or other fuel, then the ash content could not be regarded as reasonably low. It would be too low, because the cost was too high. Therefore, reasonably low must mean as low as was economically practicable.

VOTES OF THANKS.

A hearty vote of thanks was accorded those responsible for the organization of the meeting, special reference being made to Dr. Smith and Mr. Talbot, the vote also including Prof. Smithells as Chairman.

Prof. SMITHELLS, acknowledging the vote of thanks, took the opportunity to propose another to Mr. Woolcock, President of the Association, for the great success of the Congress as a whole, which, he said, was largely due to the efforts of Mr. Woolcock.

Pneumatic Ash Conveyor.

The July issue of "Combustion" contains an account of an interesting conveyor which has been developed by the Conveyors' Corporation of America. In this pneumatic machine, steam is the motive power, but it does not come in contact with the material at any stage of the handling, and all the substances are delivered in the same condition as that in which they are fed in. It is capable of an hourly delivery of 18·6 tons of 2-in. coal screenings, 25·2 tons of dry stoker ashes, and 21·7 tons of wet combustion ashes. An interesting experiment was tried with the plant. A piece of rock, roughly rounded so that it would just enter the end of the 5-in. intake pipe, was passed through the conveyor several times. This rock did not cause the slightest difficulty, nor was there any delay in picking it up. When held at the opening, it was instantly drawn out of the hand, and it passed through the mechanism without noise. The equipment consists in general of a conduit or pipeline of desired length, wherein is located the intake opening or openings into which the material is fed. This conduit terminates at, and is joined to, the operating head. The latter head is divided into two zones, termed respectively the accumulator zone and the suction zone. The lower section constitutes the former, while the upper section is the suction zone. Outlet from the operating head leads into an exhauster of the steam jet type, or a motor-driven rotary exhauster. The operating head is provided with three openings, one through the conduit line providing for the entry of material to be conveyed, a second at the gates of the accumulator zone providing for the discharge of the accumulated material, and a third providing for the exit of the air used in the conveyor line. The operation of the equipment is as follows: The exhauster is started, withdrawing the air from the operating head through suction zone, which contains no material. The gates being closed, the only point through which air can be drawn to replace that extracted from the operating head is through the conduit, wherein is established the current of high velocity and volume necessary to carry the material. Material collects in the accumulator zone to a predetermined weight, for which adjustment can be made. When it has reached this weight, release of the gates is effected through a hydraulic device, whereby the gates are opened and the accumulated material is discharged into a tank, pile, or open car, as may be desired, at the bottom of the operating head. The moment that the material has been completely discharged, the gates are automatically restored to their original closed position, hermetically sealing the operating head by means of a cylinder, and a repetition of the former process of accumulation takes place.

Brass Melting Figures.

The Southern Machine Works at New Orleans have had in operation for some time a gas-fired brass melting furnace, with regard to which Mr. S. L. Drumm (Industrial Gas Engineer to the New Orleans Public Service Company) has furnished some figures to the American Gas Association "Monthly." Air is raised to 1 lb. pressure by a blower, and gas at zero pressure is inspirated; the two being exactly proportioned for complete combustion. The crucibles will stand from 60 to 65 heats. The alloy melted consists of 88 p.ct. copper, 10 p.ct. tin, and 2 p.ct. lead. The average time required per melt is 75 minutes. With gas at $1·17 per 1000 c.ft. the cost is about ½ c. per lb.

Demonstrating Gas Equipment.

It has been announced that, with the object of educating the public to the benefits of adequate gas equipment in the home, arrangements have been completed in America for the erection of thirty-six model demonstration houses. The movement is being sponsored by the American Gas Association, who have joined with other organizations in a co-operative campaign to call the attention of the public to the latest developments in the home building field. The plans and specifications for the homes have been approved by engineers of the American Gas Association, who have worked in co-operation with leading architects and building specialists. The layout of piping and flues, the location of gas outlets, and other details have been carefully arranged to conform to modern practice.

GAS PLANT EXTENSIONS AT FULHAM.

GAS LIGHT AND COKE COMPANY'S BIG SCHEME INAUGURATED BY THE PRESIDENT OF THE BOARD OF TRADE AND LADY CUNLIFFE-LISTER.

The Gas Light and Coke Company marked another "red letter" day last Thursday—on this occasion at their Fulham Works, where, as those who have been privileged to visit them know, extensions to the carbonizing, coal handling, and other plant have for some time been in progress. With appropriate ceremony, and in the presence of a large and distinguished company (including many men well known in the gas industry), the new coal handling plant and Glover-West vertical retort installation were set to work by Lady Cunliffe-Lister, after an interesting speech by the President of the Board of Trade.

FULHAM STATION FROM THE AIR.

To enable them to keep pace with the ever-growing consumption of gas—in the past four years their sales have increased 20 p.ct.—the Gas Light and Coke Company naturally find it necessary to be continually adding to their plant. The present month has witnessed the inauguration of two large schemes of extension, for which Mr. Thomas Hardie, as Chief Engineer, has been responsible. On July 10, the King and Queen visited the Company's works at Beckton, in the East of London, to inaugurate the largest coal handling plant in Europe, and to see the latest developments of the gigantic organization there for supplying one-half of the gas used by the 5 millions of people who live and do business in the Company's area of supply; while on July 22 the President of the Board of Trade (the Right Hon. Sir Philip Cunliffe-Lister, K.B.E., M.C., M.P.), accompanied by Lady Cunliffe-Lister, went to the West of London to inaugurate at the Company's works in Fulham an extension of the gas making, purifying, and storage plant which, in itself, is large enough to supply all the gas used by many an important city, but will not, in fact, provide for more than one year's average increase in the Company's sales.

NEW PLANT.

The new plant at Fulham which gave rise to last week's ceremonies mainly comprises:

A complete coal unloading, stocking, reclaiming, and transporting installation for supplying the entire requirements of the enlarged works, amounting to 1000 tons per day, from colliers brought alongside the Company's wharf in the River Thames.

An installation of carbonizing plant with the complete sequence of condensing, exhausting, washing, purifying, measuring, and naphthalene extraction plant, of a capacity of 7,000,000 c.ft. per day.

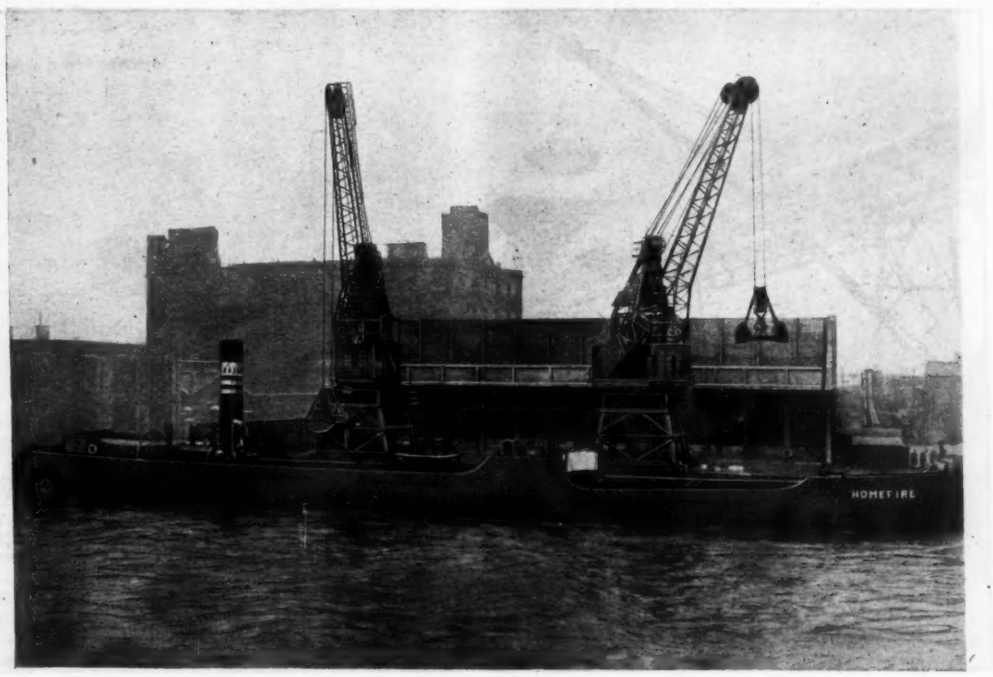
The reconstruction of a 2,000,000 c.ft. gasholder to 4,000,000 c.ft. capacity.

The site of the Fulham Works—one of the oldest of the London gas-works now in existence—covers an area of close upon 30 acres, and in part adjoins the north bank of the Thames a short distance above Chelsea railway bridge. A creek, from the river, terminating in a dock, has in the past enabled coal barges, loaded at the Company's Beckton Works, to be unloaded by three wharfside cranes. Now, however, the Company's colliers can come direct to Fulham from the coalfields of the North, and be berthed alongside the works. This new method of coal handling called for a substantial addition to the Company's fleet of colliers. Two new boats have been built at Sunderland, and are already in commission; while a third is now being built.

It was on the river front, facing the s.s. "Fireglow"—a collier of 1800 tons capacity—that the first of last Thursday's pretty ceremonies took place. Here a gaily decorated stand had been erected, to accommodate the large number of invited guests. With so many well-known people present, it is impossible to mention more than a very few; but it may be stated that, in addition to the President of the Board of Trade and Lady Cunliffe-Lister, those who accepted invitations to be present included Lieut.-Col. Sir P. F. Cunynghame, Bart., O.B.E., J.P. (Chelsea Borough Council), Alderman W. J. Waldron, J.P. (Mayor of Fulham), Col. K. P. Vaughan-Morgan, M.P., O.B.E., Mr. Percy Ashley, C.B. (Principal Assistant Secretary, Industries and Manufactures Department, Board of Trade), Mr. J. F. Ronca, O.B.E. (Director of Gas Administration, Board of Trade), Sir John S. Hindley, Commander E. C. Shankland, R.N.R. (Port of London Authority), Sir Dugald Clerk, K.C.B., D.Sc., F.R.S., Sir Arthur M. Duckham, K.C.B., Sir H. P. Maybury, K.C.M.G., C.B., Mr. W. J. A. Butterfield, Mr. W. Doig Gibb, O.B.E., Prof. W. A. Bone, and Dr. R. Lessing.

THE FIRST CEREMONY.

The s.s. "Fireglow" is the steamer which was at Beckton Pier on the occasion of the recent visit of Their Majesties. She is said to be the largest steamer that has ever come up above the Thames bridges. Her length is 240 ft. over all, and beam 36 ft.; and she carries a crew of seventeen. Her smart and efficient-looking officers and men are justly proud of her. It was across her deck that Sir Philip and Lady Cunliffe-Lister, with the Governor and Mrs. Milne Watson, the Directors, and Mr. Hardie—who had come from Westminster by launch—walked to the platform, where they were met by Mr. A. H.



THE COAL UNLOADING PLANT.

Solomon (the Engineer of the Station), after which Lady Cunliffe-Lister was presented with a lovely bouquet by little Miss Grogono, daughter of the Second Engineer at Fulham.

Mr. MILNE WATSON said:

I want to express on behalf of the Directors of the Company and myself our great pleasure at the honour that is being done to the Gas Light and Coke Company to-day by the President of the Board of Trade and Lady Cunliffe-Lister coming down here to open this extension of the works. We all know what a busy man the President of the Board of Trade is; and we do appreciate highly the fact that he has found time to visit our Fulham Works. These works are not the largest of the Gas Light and Coke Company, but they are one of the most important, and the new plant we are inaugurating to-day will enormously increase their output and efficiency. We have erected on this spot a new wharf; and we are providing large steamers which will bring coal here without its being transhipped at all or in any way handled until it is unloaded by these cranes. This will represent an immense saving of money, owing to the cutting-out of the transhipping of the coal.

Lady Cunliffe-Lister Accepts a Bouquet from Miss Peggy Grogono.

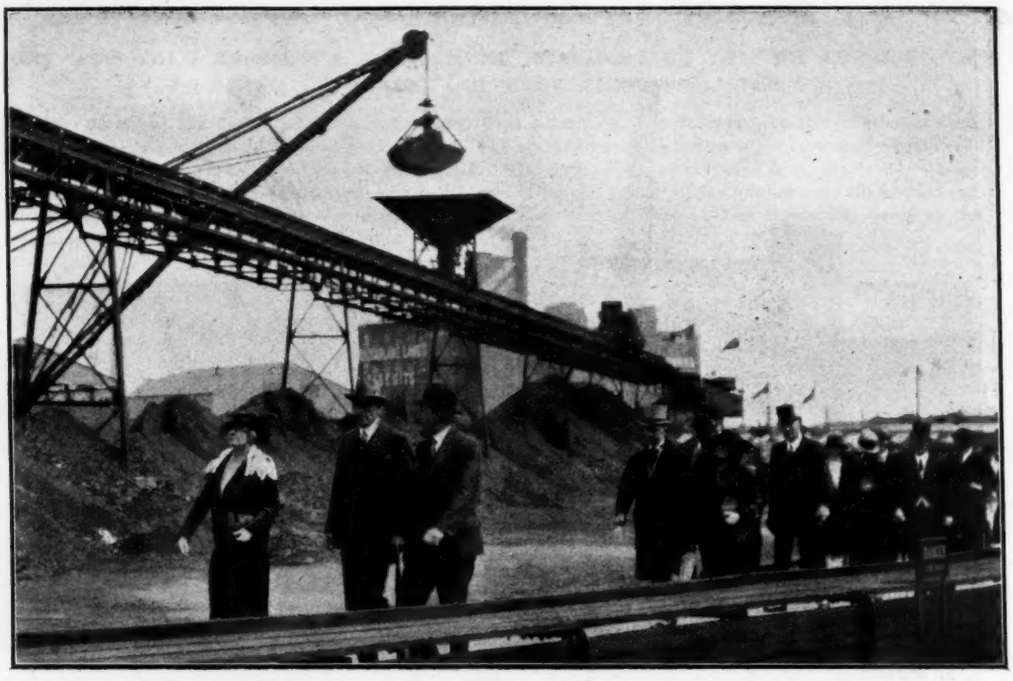
We are much indebted to the President of the Board of Trade and Lady Cunliffe-Lister for their presence here to-day. The gas industry is specially under the protection of the Board of Trade; and we are particularly glad to have our "tutelar deity" among us.

The PRESIDENT OF THE BOARD OF TRADE, in reply, said:

I am very glad to be here to-day to accompany my wife—who, I believe, is to have the privilege of actually starting the new plant. It is very pleasant to hear myself welcomed as the "tutelar deity" of the gas industry. I was never very sure whether the relationship was really that of a deity, or another thing. However that may be, I am glad of the occasion, because it gives me an opportunity of saying one or two things which I should like to say about the gas industry.

The Gas Light and Coke Company, whose plant we are inaugurating this afternoon, can look back upon more than a century of work. It has almost passed from the status of an undertaking to the status of an institution; and

One of the 7½-Ton Cranes.



SIR PHILIP CUNLIFFE-LISTER WITH THE CHIEF ENGINEER, MR. THOMAS HARDIE.

when this happens people are perhaps a little inclined to forget the vicissitudes through which an undertaking has passed, and to ignore the many achievements which stand to its credit. The gas industry—of which the Gas Light and Coke Company is, I think, the largest unit—surely has a claim upon our consideration to-day. It is an industry which serves practically everybody in this country. We all use gas. But what is sometimes forgotten is that gas is not only occupying a great place in the domestic life of this country, but that it is a really great industry from other points of view. I believe that something like £170,000,000 of capital has been invested in this country in the industry, which has over 8,000,000 customers (and, of course, a great many more users), and uses more than 17,000,000 tons of coal a year. If that stood alone, it would suffice to place it very high in the ranks of industries.

Our fathers regarded gas merely as a means of light; but it has now passed, by a process of evolution and development, from light to heat, and to-day it is an expanding industry. It would be a very superficial observer who said that the age of gas was passed; and I think it would be an almost equally superficial observer who said that gas was going to give way to electricity, and that the two were merely competitors. It is true that gas and electricity do compete to some extent in some new spheres; but surely the wiser view, the longer view, the more correct view, is that, though they may be competitors in this or that direction, in the great field that lies before them they are not so much rivals, they are allies, and should be allies, in service. ["Hear, hear."]

The gas industry is not only a great public utility service; it is a great industry. The actualities and the potentialities of it are by no means generally appreciated. It is one of the key industries of the country. No one who had anything to do with the effort that this country was called upon to make during the war has forgotten the great service which the gas industry rendered, and which no other industry in the country could have rendered, to make that effort possible; but that service, great as it was, was but a prelude to what that important industry can do in times of peace. It not only serves our domestic needs, but it provides smokeless fuel; and as this is the age of slogans, I suggest that every gas company should put at the head of its notepaper: "Hygiene in the Home." The gas industry is the handmaid of agriculture, because it provides one of the greatest of fertilizers in the country. It contributes greatly to the improvement of our roads by the production of tar. It serves the new system of locomotion by its production of benzole; and in a hundred-and-one bye-products—many already attained, and many more in process of development—it affords a happy hunting-ground for distinguished chemists. It is perhaps a revelation to the ordinary domestic consumer—the user of a gas fire or of a gas cooker—to realize that he or she is not only satisfying his or her requirements, but is also stimulating the application of science in industry. There is unlimited scope before the industry; and with the scientific development which has taken place, anyone who begins to appreciate what the gas industry has passed through must be certain that it has a great and expanding future before it.

And when you return to the labour side, this industry is not less interesting or instructive. It has been in some of its companies, and its oldest companies, a pioneer in profit-sharing; and to-day you have the spectacle of the workman, the consumer or client, and the shareholder all directly sharing in the success of the industry in which they all are interested.

I will now only add this: It is a great industry, and I think it is greatly served. It has been my privilege to have a good many dealings with the National Gas Council; and I would like to say here and now that I have never met a more practical or more broad-minded body with whom to deal than the National Gas Council. [Applause.] Therefore, ladies and gentlemen, I am indeed glad to be here to-day, not only at the inauguration of this new and efficient plant, but to pay my tribute to an industry which is at once of fundamental importance to our social life and a key industry in the development of the chemical industries of this country. I am sure that the industry has a great future before it, and that it is entitled to claim that it should be regarded both as a public utility service of the highest importance to the social life of the country and also as a great progressive chemical industry. Its development is vital to the industrial prosperity of this land. I have therefore much pleasure in declaring this plant open.

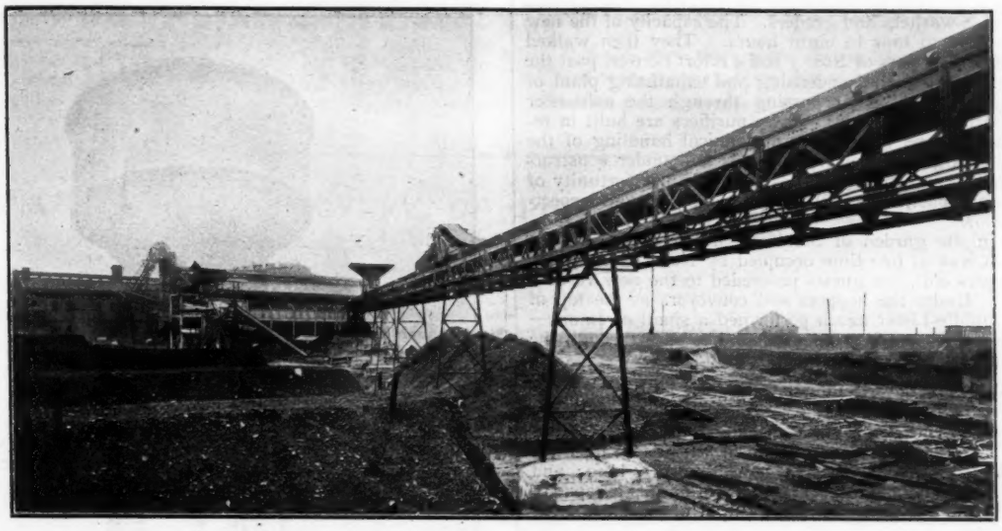
Lady Cunliffe-Lister then, by pulling a lever, set the machinery in motion. When the lever was pulled, the two travelling cranes started picking up coal from the ship in their 4-ton grabs, which dumped it in the 2000-ton hopper.

This ceremony was followed by the presentation by the Governor to Lady Cunliffe-Lister of a beautiful silver rosebowl.

Coal Handling Plant.

For the reception of the colliers holding a cargo of 1800 tons of coal, the river wall has been strengthened over a length of 300 ft. by the driving of reinforced concrete sheet piling. The piles are 33 ft. long by 18 in. by 16 in. In front of this has been constructed a deep berth. At the upstream end of the berth a timber groyne, 108 ft. long, has been constructed stretching into the river. The other end slopes up gradually to the river bed. The depth of dredging of this berth is 12 ft., and 20,000 cubic yards of material were removed.

On the wharf is laid a crane track of 20 ft. gauge, upon which operate two Stothert & Pitt travelling cranes with level luffing, each of 125 tons per hour capacity. Each crane weighs 100 tons, and hoists a Barnard dumping grab of 4 tons capacity at 250 ft. per minute. The rating of the cranes is 7½ tons load at 58 ft. radius. The hoist motor is 150 H.P., the slewing motor 30 H.P., and the luff and travel 15 H.P. each.



GENERAL VIEW OF LINE OF BELT CONVEYORS.

Looking from stockyard towards the new retort house.

Behind the cranes is a reinforced concrete bunker 135 ft. long and 38 ft. wide by 41 ft. maximum height, holding over 2000 tons of coal. There are thirteen doors in the base of this hopper, which release the coal into two travelling mechanical feeders, each having three rates of discharge—namely, 80, 150, and 250 tons per hour—driven by a 3-H.P. motor.

The feeders discharge on to a rubber belt conveyor 180 ft. long, 36 in. wide, travelling at 260 ft. per minute, and having a capacity of 250 tons per hour. This belt discharges on to another of the same width, 570 ft. long, at right angles, which rises in two inclines from below ground level to a height of over 26 ft. This conveyor is also of 250 tons capacity, and travels at 280 ft. per minute.

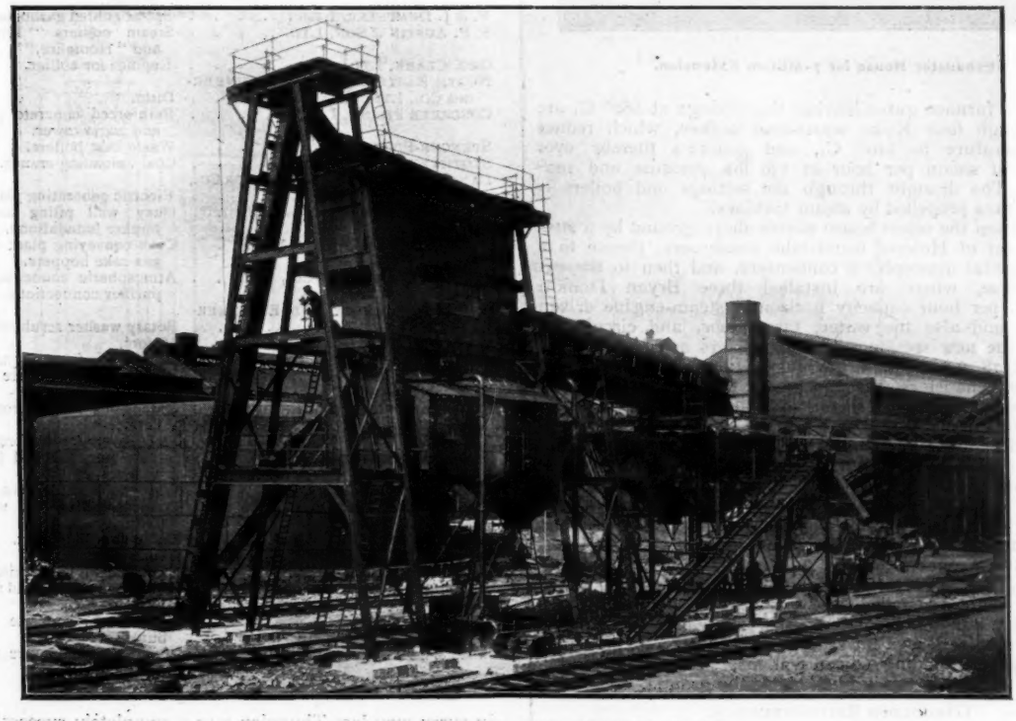
At the end of the conveyor the coal discharges on to a further 36 in. belt, 500 ft. centres, which traverses the coal storage ground, 26 ft. above it. This belt runs at 300 ft. per minute. A throw-off carriage is fitted to it, and also a travelling feed hopper, by means of which coal to the storage ground can be stocked and reclaimed by means of a Mitchell travelling crane, built by Henderson, of Aberdeen. The crane operates, on a 10-ft. gauge **U**-shaped track, at 150 tons per hour, and has a 60 ft. radius. It has a 3½-ton capacity four-wire grab, hoisting at 150 ft. per minute by a 120-H.P. motor. The capacity of the stockyard at 20 ft. height is 40,000 tons.

Coal from the conveyor not required for stocking, or reclaimed coal, is discharged at its end into two 30-in. Jeffrey single-roll crushers, each capable of crushing 150 tons of run-of-mine coal to 1-in. cube, and driven by 65 H.P. motors. From the crushers the coal is again taken overhead by a 30-in. conveyor of 250 tons per hour capacity, at 350 ft. per minute, a distance of 340 ft.

Here the coal can be discharged into the original coal belt system or taken to the new No. 1 retort house by a further conveyor 24 in. wide and 420 ft. long, which rises 90 ft. into the air to clear the retort house roofs. This conveyor is of 150 tons per hour capacity, and runs at 400 ft. per minute. The total distance from the bunkers to the end of this belt system is nearly half a mile; and the total power for driving the five belts is 72 H.P. The coal is automatically weighed by the ship discharge cranes, and also during travel to the No. 1 retort house.

THE SECOND CEREMONY.

The party next proceeded on foot up the line of conveyors, nearly half a mile in length, passing the stocking cranes, which were reclaiming coal from storage to the belts at the rate of 150 tons an hour. They saw coal discharged from the belts to storage heaps at the rate of 250 tons an hour, and passed the



NEW COKE WASHING AND GRADING PLANT.

Input capacity, 70 tons in 8 hours.

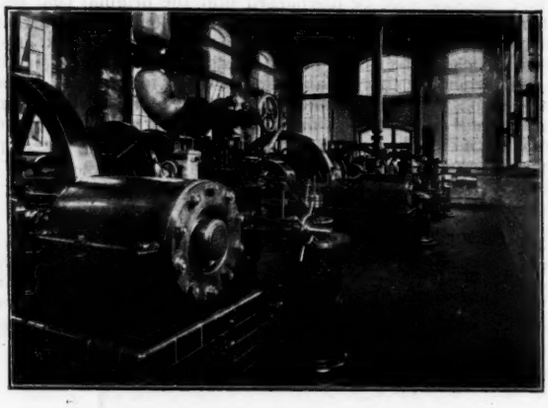
coke and breeze washers and graders. The capacity of the new washing plant is 70 tons in eight hours. They then walked under the coke conveyors of Nos. 3 and 4 retort houses, past the works power plant, to the condensing and exhausting plant of the new installation. After passing through the exhauster house, the purifiers were seen. These purifiers are built in reinforced concrete, and incorporate mechanical handling of the oxide. The enlarged gasholder, which is still under construction, was visited, and those who desired had an opportunity of walking in small parties on to the top of the holder and inspecting the interior.

After tea in the garden of Sandford Manor House on the works (which was at one time occupied by Nell Gwynne, and is over 400 years old), the guests proceeded to the new vertical retort house. Under the hoppers and conveyors at the top of this, Lady Cunliffe-Lister again performed a small ceremony—that of pulling a lever which released coal to pass through the feeding chamber into the retorts.

Carbonizing Plant in No. 1 Retort House.

This consists of an installation of Glover-West vertical retorts. There are two benches, each with 8 beds of 8 retorts, a total of 128 retorts. The retorts are 33 in. by 10 in. at the top, tapering to 39 in. diameter at the base. They are 25 ft. long; and 17 ft. of this length is in silica. The installation has a capacity of 450 tons of coal per day, and a gas output of 7,000,000 c.ft., or 35,550 therms.

The coal bunkers hold 48 hours' supply of coal, and the producer feed hoppers 12 hours' supply. Coke to the producers is automatically weighed. The coal and coke are handled by two gravity bucket conveyors encircling the benches longitudinally, each having a capacity of 70 tons per hour on coal or 40 tons on coke. The coke from the plant is taken by drag-bar conveyors to the water gas plant, to a set of steel hoppers for yard trade, or to a newly-erected set of reinforced concrete hoppers arranged for rapid loading of carts, railway trucks, or barges.



Exhauster House for 7-Million Extension.

The waste furnace gases leaving the settings at 880° C. are passed through four Kirke waste-heat boilers, which reduce their temperature to 210° C., and generate thereby over 26,000 lbs. of steam per hour at 130 lbs. pressure and 100° superheat. The draught through the settings and boilers is induced by fans propelled by steam turbines.

The gas from the retort house passes above ground by a steel main to a set of Holmes water-tube condensers, thence to a set of horizontal atmospheric condensers, and then to the exhauster house, where are installed three Bryan Donkin 175,000 c.ft. per hour capacity horizontal steam-engine driven exhausters, and also the water, tar, liquor, and circulating pumps for the new section. The exhausters are four bladed, running at 78 r.p.m., and the engines are each 37·5 h.p. Leaving the exhausters, the gas passes through two Cockey-Livesey type washers, and then two Whessoe rotary washers, on its way to the purifiers.

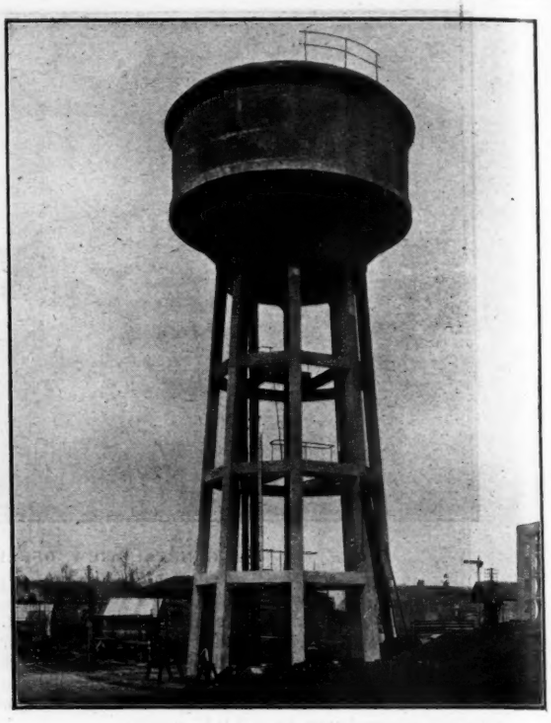
The purifier house and boxes are reinforced concrete structures with overhead boxes and oxide floor above. There are eight purifiers each 50 ft. by 35 ft. by 6 ft. 6 in. deep. The floor of the oxide boxes is 13 ft. above ground level, and the structure is 102 ft. by 143 ft. over-all area. An oxide handling plant of 30 tons per hour capacity is in course of construction.

For the measurement of the gas made, a twin meter of 500,000 c.ft. per hour total capacity, standing partly below ground in a well, is installed.

The purifier building displaced the works water tower; and this has been replaced by a tower of reinforced concrete designed by the Company, holding 60,000 gallons, 30 ft. diameter by 16 ft. deep. The tank top is 75 ft. above the ground.

Gasholder Reconstruction.

In the brick tank of No. 4 holder, originally erected in 1856, and of 2,000,000 c.ft. capacity, is being erected a new spiral-guided holder of four lifts, and a capacity of 4,000,000 c.ft. The holder rises to 128 ft. and the rise of the crown is 11 ft. 6 in.



60,000-Gallon Concrete Water Tower.

The reconstruction scheme has also involved additions to the works plant of electricity generating apparatus, both alternating and direct current, totalling 1500 kw.; coke grading plant having a capacity of 70 tons in eight hours; and the provision of bunkers to the water gas generators.

The importance of chemical research has long been realized by the Company; but in order to provide additional facilities, work has now been begun on the erection of large additional research laboratories at Fulham, as well as a complete experimental plant for full-scale tests under working conditions.

Principal Contractors.

West's Gas Improvement Co., Ltd.	Vertical retort installation.
Mitchell Conveyor and Transporter Co., Ltd.	Coal conveying plant and stocking crane. Weighing coke tippler.
R. & J. Dempster, Ltd.	Spiral guided gasholder.
S. P. Austin & Son, Ltd.	Steam colliers "Fireglow" and "Homefire."
Geo. Clark, Ltd.	Engines for collier.
North Eastern Marine Engineering Co., Ltd.	Ditto.
Concrete Piling, Ltd.	Reinforced concrete purifiers and water tower.
Spencer-Bonecourt, Ltd.	Waste-heat boilers.
Stothert & Pitt, Ltd.	Coal-unloading cranes.
Lancashire Dynamo and Motor Co., Ltd.	Electric generating plant.
Saxild & Partners	Quay wall piling and coal bunker foundations.
Samuel Cutler & Sons, Ltd.	Coke conveying plant and oil gas coke hoppers.
Stanton Ironworks Co., Ltd.	Atmospheric condensers and purifier connections.
Whessoe Foundry and Engineering Co., Ltd.	Rotary washer scrubbers.
W. Parkinson & Co.	Meters.
Flower & Everett, Ltd.	Dredging in front of quay wall.
Peter Lind & Co.	Reinforced concrete coal bunkers.
Horseley Bridge and Engineering Co., Ltd.	Extensions to cast-iron purifiers.
Edward Cockey & Sons, Ltd.	Steel covers for reinforced concrete purifiers and Livesey washers.
W. C. Holmes & Co., Ltd.	Water tube condensers.
M. Coulson & Co., Ltd.	Coke screening and washing plant.
R. Dempster & Sons, Ltd.	Oxide handling plant.
Bryan Donkin Co., Ltd.	Exhausters.
Siemens Bros. & Co., Ltd.	Electric cables and switchgear.
J. F. Blair & Co., Ltd.	Boundary wall and grid for coal bunker.
K. Holst & Co.	Reinforced concrete coke bunkers.
Press & Summers	Erection of condensers, mains, &c.

In every way last Thursday was a completely successful and thoroughly enjoyable day; and for this—as was the case on the occasion of the recent Royal visit to Beckton—credit was largely

due to the thoroughness with which the arrangements had been made, and the perfection of the organization which secured their smooth carrying-out, down to the very smallest detail. The responsibility for this was largely that of Mr. R. W. Foot, the Assistant General Manager of the Company. May we borrow a phrase which presents an admirable summing-up of what may be deduced from the Beckton and Fulham functions? It is:

"Never were there more obvious signs of growth and activity in the gas industry than at the present time; and that means further advance in the 'Blue Sky' movement."

ELIMINATION AND RECOVERY OF PHENOLS FROM CRUDE AMMONIA LIQUORS.

By ROBERT M. CRAWFORD, of the McAleenan Corporation, Pittsburgh.

[From "Industrial and Engineering Chemistry."]

Waste liquors from coke-plant ammonia stills constitute a known source of stream pollution due to the presence of very appreciable quantities of phenol and cresols, which are scrubbed out of the gas by the flushing liquors, and which ultimately reach a stream *via* ammonia still wastes. In the crude ammonia liquor the phenols exist in solution in the "free" state; but when lime is added in the still to decompose the fixed ammonia, most, if not all, of the phenols are "fixed," and pass into the still waste as calcium phenolates. This fixing of the phenols probably explains why the phenols are not often found in the free state in the still wastes. However, owing to the absorption of carbon dioxide from the atmosphere adjacent to the waters of a stream, or perhaps to mineral acids in the stream, the phenolates are decomposed, liberating the phenols in free state. The free phenols thus constitute a source of stream pollution. This liberation may take place at a considerable distance down stream from the offending coke plant.

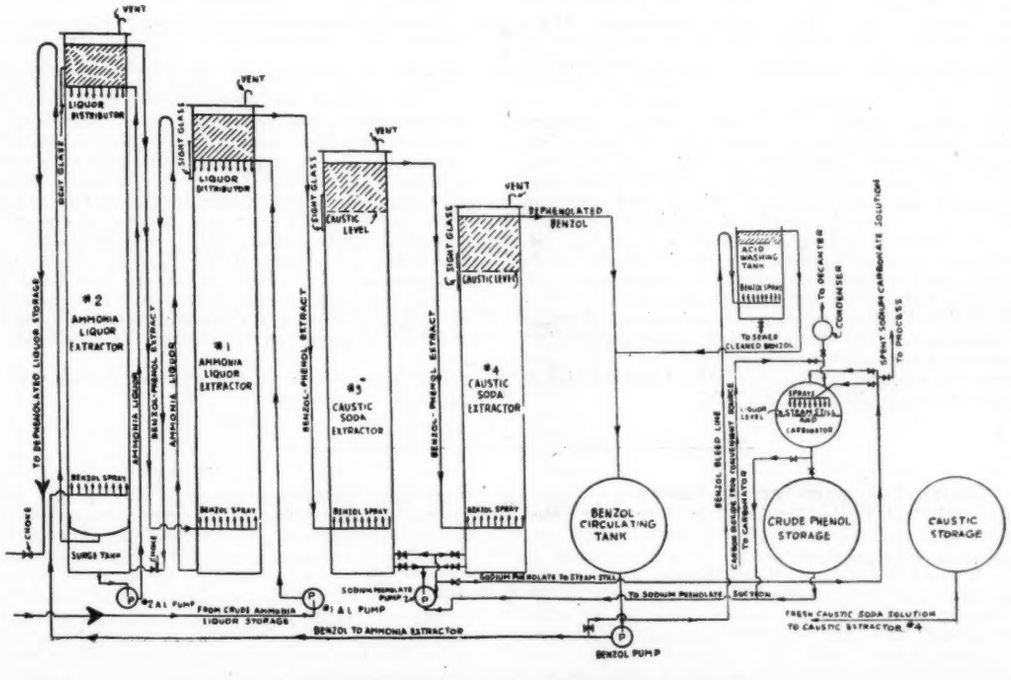
In order to prevent such stream pollution, it has become customary practice in the coke-oven industry to quench the hot coke with ammonia still wastes, which affords a simple and easy means of disposal. This method, however, seems to have certain obvious objections: (1) The phenols are completely vaporized with the water, and are dissipated into the atmosphere only to condense and collect on surrounding territory, perhaps to be washed into a stream by natural rainfall. (2) Corrosive compounds contained in the still waste, or formed during quenching of hot coke, give rise to rapid deterioration of quenching equipment. (3) A marked discoloration and a disagreeable odour are imparted to the coke, which affect its sale for domestic purposes. (4) If suspended calcium salts exist in the still wastes, clogging of the coke pores results, which prevents the free burning of furnace coke.

In investigating commercial means for the possible recovery of the phenols from the crude liquor, the writer recalled a method used early in the world war for recovering phenol from the waste liquors from synthetic phenol fusions. This method consisted simply in extracting the waste liquors with benzole, which dissolved out the phenol. Dawson* describes a similar method used in England for the same purpose. For the recovery of the phenol from the benzole extract, the method suggested by Weiss in 1916 offered the most likely procedure, which was to remove the phenol from the benzole extract by means of a solution of caustic soda. These basic methods of procedure offer practical possibilities which have been demonstrated successfully on a commercial scale by the Foundation Oven Corporation's installation for the Hudson Valley Coke and Products Corporation, at Troy (N.Y.); and similar installations by the National Tube Company and the Iroquois Gas Corporation. These three installations operate over the same basic principles, and differ only in details of operation.

* "J. Soc. Chem. Ind.," **39**, 151T (1920).

DESCRIPTION OF SYSTEM.

The crude ammonia liquor is pumped continuously into a distributor line located somewhat below the top of No. 1 extractor; the liquor in the extractor being maintained at the distributor pipe level by means of an inverted **U**-pipe overflow line. The liquor flows downward in the extractor, leaves *via* the overflow line, and is collected in a surge tank comprising the lower portion of the No. 2 extractor. From the surge tank the liquor is then pumped to the distributor line near the top of No. 2 extractor, and leaves *via* No. 2 overflow line, flowing by gravity to storage, for the dephenolated liquor. Ninety p.ct. benzole (or motor fuel) is passed in the opposite direction in each extractor by being pumped into spray distributor pipes submerged in the ammonia liquor near the bottom of each ammonia liquor extractor. The finely divided benzole spray enters first at the bottom of No. 2 extractor, and floats upwards through the down-flowing ammonia liquor, exposing an enormous surface for extraction. Upon reaching the liquor level near the top, the benzole extract separates out as a supernatant layer, which overflows into the spray distributor line at the lower part of No. 1 extractor, in which it performs the same function. By means of this continuous counter-current extraction system, it is obvious that the desirable conditions



FLOW-SHEET FOR PHENOL EXTRACTION SYSTEM.

for maximum extraction efficiency are fulfilled. Actual tests show an extraction efficiency of 98 to 99 p.ct.

The strong benzole extract leaving No. 1 liquor extractor overflows to the spray line in No. 3 extractor, where it is sprayed into a solution of caustic soda, while the overflow from No. 3 extractor goes to the spray line in No. 4 extractor, also charged with caustic soda solution, and the overflow from No. 4 extractor runs to the benzole circulating tank for re-use. The benzole thus is seen to cycle as a transfer medium taking the phenol from the ammonia liquor and delivering it to the caustic soda

The caustic solution in the caustic extractors gradually reverts to sodium phenolate by the absorption of phenol; and on account of the strength of caustic necessary for proper absorption, it is not practical to run the caustic extractors continuously, as is the case with the liquor extractors. Instead, when the solution in No. 3 is saturated with phenol, it is withdrawn, replaced with the partially saturated solution from No. 4, and fresh caustic put into No. 4. During the caustic change-over, each caustic extractor is by-passed, to prevent interrupting the liquor-benzole cycle. The saturated caustic soda (sodium phenolate) withdrawn from No. 3 extractor contains, in addition to phenol, cresols, and small quantities of higher tar acids, some benzole, and also impurities such as pyridine bases, naphthalene, &c., which must be removed to prevent contamination of the final crude phenol, if the latter is to be purified. The removal of these offending impurities is effected by simple steam distillation. The dissolved benzole is recovered during the early part of the steam distillation by condensing the vapours and decanting the distillate.

Since the pyridine bases dissolved from the ammonia liquor by the benzole are not soluble in the caustic soda, it is obvious that, unless provision is made to prevent the accumulation of these bases, the cycling benzole will become fouled. In order, then, to keep the pyridine bases to a low concentration, a portion of the cycling benzole is bled continuously from the system, and sent through a small extractor containing dilute sulphuric acid, which removes the pyridine, forming the pyridine sulphates. The pyridine sulphates collected in solution in this operation are removed from time to time, being replaced with fresh acid, and are either discarded or worked-up for the recovery of crude pyridine bases for sale.

The free phenols can be liberated from the steamed phenolate solution by neutralizing with sulphuric acid or by carbon dioxide gas from some convenient source. Neutralization with sulphuric acid is done by adding the acid to a batch of phenolate in an agitating tank equipped with cooling coils, and decanting the liberated phenols after settling. The lower layer of sodium sulphate solution generated by neutralizing with sulphuric acid contains considerable phenol in solution, which can be recovered by adding the waste sulphate solution to the crude ammonia liquor entering the liquor extraction system. Scaling of ammonia stills due to any calcium sulphate formed from the waste sulphate liquor and the still lime has been found to be negligible.

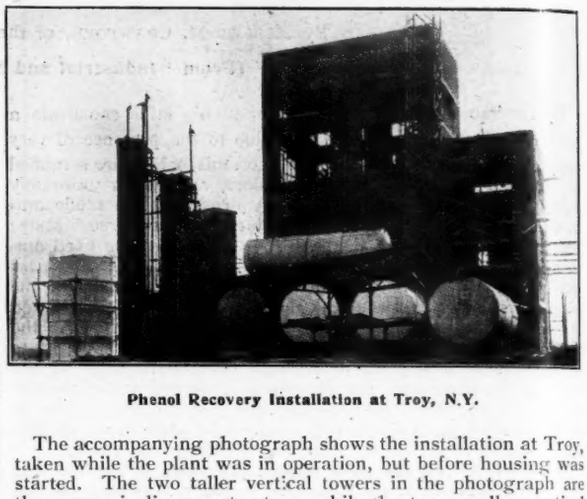
Neutralization by means of carbon dioxide gas is conducted by bringing about an efficient absorption of the gas by the alkali phenolate. In this process the crude phenols separate out as with the sulphate method; but the lower layer of spent liquor in this case consists of a solution of sodium carbonate. At the Troy installation the carbon dioxide method is found practical because the sodium carbonate solution generated in neutralization can be used as make-up for a Koppers liquid purification unit, which is used for desulphurizing coke oven gas.

Certain advantages appear with the use of carbon dioxide as a neutralizing agent, in comparison with sulphuric acid. Considerable organic sulphur compounds are picked up and fixed by the caustic soda; and although these are partly liberated as hydrogen sulphide gas when sulphuric acid is used, much of the sulphur compounds remains fixed and soluble in the phenol recovered. The phenols in this case must be separately desulphurized before they can be properly purified. By the use of carbon dioxide gas these sulphur compounds remain fixed, but are soluble in the sodium carbonate solution generated, and thus the phenols are less liable to sulphur contamination. A minor additional advantage of the use of carbon dioxide is the fact that the phenols are insoluble in the spent carbonate liquor, and there is no need to effect a recovery of soluble phenols, as is the case when neutralizing with sulphuric acid.

A typical analysis of the crude phenol obtained by the methods described is as follows:

	P.Ct. (by Volume).
Water	12
Phenol	51
Cresols	26
Higher acids and residue	11

A modification of the usual methods for purifying crude phenols has been devised by the writer for making phenol (U.S.P.) and 98 p.ct. refined cresylic acid. It is interesting to note that the cresol present in the crude phenols by this extraction system is mainly orthocresol.



Phenol Recovery Installation at Troy, N.Y.

The accompanying photograph shows the installation at Troy, taken while the plant was in operation, but before housing was started. The two taller vertical towers in the photograph are the ammonia liquor extractors, while the two smaller vertical towers are the caustic soda extractors. The large horizontal tanks are used as storage tanks for benzole, caustic soda solution, crude phenols, and sodium carbonate solution, respectively. The small horizontal tank located above the large tanks is a combined steam still and carbonator.

System in Operation.

With a crude ammonia liquor containing 2 grammes of phenol per litre, which is about the average, the raw materials consumed per 1000 gallons of liquor are approximately as follows:

	Pounds.
Caustic soda (100 p.ct. NaOH)	14
Benzole (loss)	5
Sulphuric acid (66° Bé.)	17
Carbonic acid (if used instead of sulphuric)	9

The products recovered by the use of carbonic acid neutralization are approximately as follows, per 1000 gallons of liquor:

	Pounds.
Sodium carbonate (100 p.ct. Na_2CO_3)	18
Crude phenols	16·6

Operating labour requires the part time of one man, who can easily handle the operation along with other duties; also the part time of a plant chemist is necessary to handle periodical tests.

Under certain conditions peculiar to this process of recovery for phenols, the writer finds that crude sodium bicarbonate can be used to neutralize the sodium phenolate solution with the same efficiency as with the other neutralizing agents. When neutralizing with sodium bicarbonate under these special conditions, it is obvious that another molecule of sodium carbonate results; and the amount of sodium carbonate recovered in this case is 36 lbs. per 1000 gallons of liquor, instead of 18 lbs. noted above in the carbonic acid neutralization.

The writer is indebted to W. H. Wright, Vice-President of the Foundation Oven Corporation, designers and builders of the entire coke plant of the Hudson Valley Coke and Products Corporation of Troy (N.Y.), for permission to write this article, and for his co-operation in making the phenol installation a success.

Patent applications have been filed covering the essential features of this process.

Goodall Coke Quencher and Loader.

The "Iron and Coal Trades Review," in their issue dated July 16, give an illustrated description of the Goodall coke quenching and loading machine, which is manufactured by Messrs. W. J. Jenkins & Co., Ltd., of Retford. One of the advantages claimed for this machine is that it gives a certain degree of security against labour troubles, as only one man, and another on part time, are required to quench, screen, and load the coke into trucks. The water required for quenching is under complete control, and can be regulated with ease and precision, the moisture percentage in the coke being reduced to a minimum. Substantial saving is effected in a reduced production of breeze, owing to the gentle treatment of the coke and the absence of intermediate handling. The machine claims to save fifteen minutes in the discharging and charging of each oven; and the saving effected in labour alone is said to have worked out at from £1500 to £2000 on fifty to sixty bye-product coke ovens. Where new batteries are contemplated, a great deal of costly work in the building of quenching floors can be saved. The machines are made to suit either alternating or direct electric current of any desired voltage; and where current is not available, a steam engine and boiler can be fitted.

FLEXIBILITY WITH STANDARDIZATION IN GAS MANUFACTURE.

Without the Need for Adjusting Consumers' Appliances.

Messrs. Humphreys & Glasgow, Ltd., as assignees of Mr. J. A. Perry, of Swarthmore, Penn., have been granted Letters Patent under the serial number 246,459 and the title "Improvements Relating to the Generation and Distribution of Gas." An Editorial in this issue comments upon the invention; and the major portion of the text of the specification is reproduced hereunder.

One important object of the invention is to avoid trouble with consumers' gas appliances, at the same time affording maximum flexibility in gas manufacture—in other words, to provide gases capable of commercial manufacture and of which some may be supplied at periods of light or normal load, and of which admixtures may be readily and economically supplied at periods of heavy load without requiring re-adjustment of consumers' appliances. Another object of the invention is to provide, for example in case of an emergency, for switching the supply to one or more districts from the kind of gas furnished at times of normal or light load to that employed at peak or abnormal load, and vice versa, without necessitating adjustment of appliances.

To these and other ends the invention, generally stated, may be said to consist in making and normally supplying an admixture of coal and producer gas, hereinafter referred to as "base gas," having properties such as specific gravity and quality (expressed in B.Th.U.) substantially equivalent to like properties of blue or carburetted water gas, hereinafter called "peak gas," and to which consumers' appliances are adjusted, and augmenting the normal supply of gas at times of increased demand by generating water gas having properties like the base gas, and adding it to the admixture to provide an increased supply. A change-over from base to peak gas for one or more districts, as in the case of emergency, may be effected by slightly increasing the quality of the peak gas whereby it can be interchanged with the base gas without re-adjustment of appliances.

The invention contemplates the utilization of the following "standard" gases. Ordinary coal gas of which the quality is substantially 450 to 575 B.Th.U., and the specific gravity from 0·39 to about 0·50 (N.T.P.); producer gas of 90 to 140 B.Th.U., and sp. gr. from 0·95 to about 0·85; blue water gas of 300 B.Th.U. and sp. gr. about 0·55; carburetted water gas of 400 to 600 B.Th.U. and sp. gr. from 0·60 to 0·85. Use is made of these standard gases in such a way that customers are supplied with a base gas under normal conditions, and this supply of base gas is augmented by admixture with peak gas at times of heavy load; or in an emergency certain districts are supplied with peak gas alone. To do this without re-adjusting customers' appliances, which consume a mixture of air and gas, in accordance with the invention regard must be had to the specific gravity of the gases so that the supply, whether base or mixture of peak and base, or peak alone, must be of substantially the same specific gravity and the same quality, although where a complete shift is made from base to peak gas the quality of the latter may well be slightly higher than that of the former.

The invention may be further described by the following illustration of its practice. For the base gas there may be used coal gas of from 0·4 to 0·5 gravity, and this is admixed with producer gas in sufficient volume and of higher gravity so that the base gas is about 440 B.Th.U. and 0·60 sp. gr. For peak gas, to mix with this base gas, carburetted water gas of approximately 0·60 gravity and 440 B.Th.U. is made, and it can be mixed satisfactorily up to as high as 75 to 80 p.ct. in the total mixture with the base gas without re-adjustment of the air or change of the burner orifices being necessary in the gas appliances. To supply one section of a gas distributing system with the peak or demand gas only, for example, when not able to mix it with the base gas, the peak gas may well be of about 10 p.ct. higher B.Th.U. quality—in the instance above referred to, about 480 to 490 B.Th.U., in which case it can be satisfactorily and completely interchanged with the base gas without necessitating re-adjustment of appliances.

The invention is not limited to 440 B.Th.U. as the quality of the base gas; and base gas of 400 B.Th.U. quality has been used and interchanged with peak gas of 445 B.Th.U. quality. The invention, in fact, is not limited to any particular heating value standard, except that the standard must be lower than at present in most localities normally established; and it may be remarked that, within reasonable limits, the lower the standard the larger the percentage of variation there can be in the mixture of the base and peak gases, and the more nearly the quality of the base and peak gases is the same, the more readily can a complete switch of the gases be made.

The peak gas has been referred to as carburetted water gas. This may be made in two ways—by making a lightly carburetted water gas or by making the present standard quality of carburetted water gas, from 500 to 600 B.Th.U., or even lower, and admixing an amount of straight or blue water gas of approximately 300 B.Th.U. so that the peak or demand gas may be an admixture of carburetted water gas and blue water gas. For example, it could be of 50 p.ct. 580 B.Th.U. gas and 50 p.ct. 300 B.Th.U. gas, providing a lightly carburetted water gas of 440 B.Th.U.

The patentees remark that in many instances, while the equipment for making coal gas is comparatively expensive and not very flexible in operation, coal gas may be preferred in admixture with producer gas for the base gas. The equipment for making water gas or carburetted water gas is comparatively inexpensive and very flexible in operation, so that carburetted water gas is well adapted for use as the peak gas. The further point is made that the base gas might be supplied throughout the entire year while the peak gas in admixture with the base gas might be supplied in the winter. An important feature is that this can be done without readjustment of the consumers' appliances, which operate properly both winter and summer.

CITY AND GUILDS OF LONDON INSTITUTE PASS LIST.

Successful Candidates in Gas-Works Practice, Gas Supply Practice, and Gasfitting Examinations.

WE have received from Mr. W. T. Dunn, the Secretary of the Institution of Gas Engineers, a list of successful candidates in the last examinations in Gas-Works Practice, Gas Supply Practice, and Gasfitting, which has been forwarded to him by the Superintendent of the Department of Technology of the Institute. The questions will be found in the "JOURNAL" for June 9 and 16, pp. 546, 609.

GAS-WORKS PRACTICE—MINOR COURSE.

FIRST CLASS.

Candidate's Name.	Examination Centre.
Robson, Colin	Stockton-on-Tees
Tomlinson, John	Manchester
Booth, Francis Noel	Rochdale

SECOND CLASS.

Candidate's Name.	Examination Centre.
Verity, William	Weymouth
Pine, Winefred Edward	East Ham
Barwell, Stanley	Salford
Pirie, Norman G. F.	Northampton
Matthews, Albert Edward	Brighton
Hargreaves, John	Bradford

GAS SUPPLY PRACTICE—MINOR COURSE.

FIRST CLASS.

Candidate's Name.	Examination Centre.
Cox, Leslie Kendrick Aubrey	Cardiff
Gee, Francis Horace	Manchester
Ford, John	Edinburgh

SECOND CLASS.

Candidate's Name.	Examination Centre.
Sullivan, Arthur	East Ham
Gunston, George Cecil	Bristol
Wise, Henry	Erith
Smith, Frederick	Nottingham
Blackhall, Colin Douglas	Edinburgh

GASFITTING—FINAL EXAMINATION.

Candidate's Name.	Examination Centre.
*Hill, John	Salford
†Salter, Fred	Acton and Chiswick Polytechnic
†Hodson, Arthur	Walsall
†Pennell, Alfred	Do.
*Bayliss, Alfred	Birmingham
*Beech, William Weston	Do.
*Brooks, Thomas William	Do.
†Craxford, Francis George	Do.
†Greenwell, Robert	Do.
†Jackson, Thos. Harold	Do.
†Read, Frederick William	Do.
*Fryer, Frank Harold	Dudley
†Williams, Thomas	Do.

* First Class. † Second Class.

The Leeds Gas Department have up to the present worked satisfactorily from stocks of coal in hand, but these are now getting low, and though it is declared that the position is safe to the end of August, arrangements are being made to secure consignments of American coal.

The Directors of the Continental Union Gas Company, Ltd., announce that it is proposed to pay, on Oct. 12 next, a final dividend of 3½ p.ct. on the preference stock (making 7 p.ct. for the year), and a dividend of 1 p.ct. on the ordinary stock (both less income-tax at 4s. in the pound), for the year ended June 30, 1926.

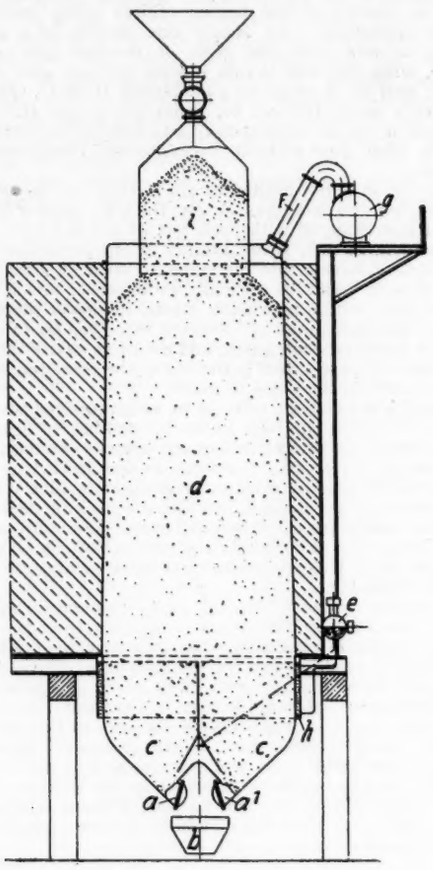
REGISTER OF PATENTS.

Vertical Chamber Ovens.—No. 240,468.

N. V. SILICA EN OVENBOUW MIJI, of Holland. [Assignees of Dr. C. Otto & Co. G.m.b.H., of Dahlhausen.]

No. 23,767; Sept. 23, 1925. Convention date, Sept. 25, 1924.

This invention consists in a plant and method for operating vertical retorts or chamber ovens so that the structure of the cake of coke formed during carbonization is loosened, in order that the coke may present a maximum surface for the formation of water gas by steaming. The accompanying drawing shows a plant constructed according to the invention.



New Type of Vertical Chamber Oven.

From the diagram, which is a vertical section, it will be seen that the cross-sectional area of the chamber enlarges in the downward direction. Beneath chamber *d* is a steam generator *h* and a coke receiving chamber *c*, which is appropriately divided into two or more equal parts. For carrying out the method in practice, a certain quantity of coke is extracted through the discharge opening *a* in chamber *c*, and let fall into the bin *b*. By doing this the coke in one half of the chamber *c* is put into motion, sinks down, and loosens its solid structure, so that the lower larger or wider part of the chamber is filled up by the loosened coke. After closing the discharge opening *a*, an equal quantity of coke is extracted from the discharge opening a^1. By thus alternately extracting coke from opposite or different points, the coke in the chamber *d* becomes loosened to such a degree that it completely fills up the lower enlarged portion or section of the chamber. The coke as it descends comes into the sphere of action of the steam generator *h*, and at the same time fresh coal slips out of the hopper *i* into the chamber *d*. For cooling the coke that has descended, a certain quantity of steam is immediately required; and this quantity is delivered automatically by the steam generator *h*, and flows through the steam receiver *e* into the coke receiving chamber *c*. The steam, by cooling the coke, becomes superheated.

Generation and Distribution of Gas.—No. 246,459.

HUMPHREYS & GLASGOW, LTD., of Victoria Street, S.W. 1 (Assignees of J. A. PERRY, of Swarthmore, Penn.).

No. 516; Jan. 7, 1926. Convention date, Jan. 20, 1925.

This highly comprehensive patent relates to the generation of different grades of gas, and their admixture in such proportions as to result in a product of level thermal value and specific gravity. The gases dealt with are coal gas, water gas (blue and carburetted), and producer gas. The major part of the specification is given elsewhere in this issue as an article entitled "Flexibility with Standardization in Gas Manufacture."

Water Gas Manufacture.—No. 254,064.

STEERE, G. R., of Owosso, Mich., and EBERLEIN, J. B., of Detroit, Mich.

No. 13,083; May 19, 1925.

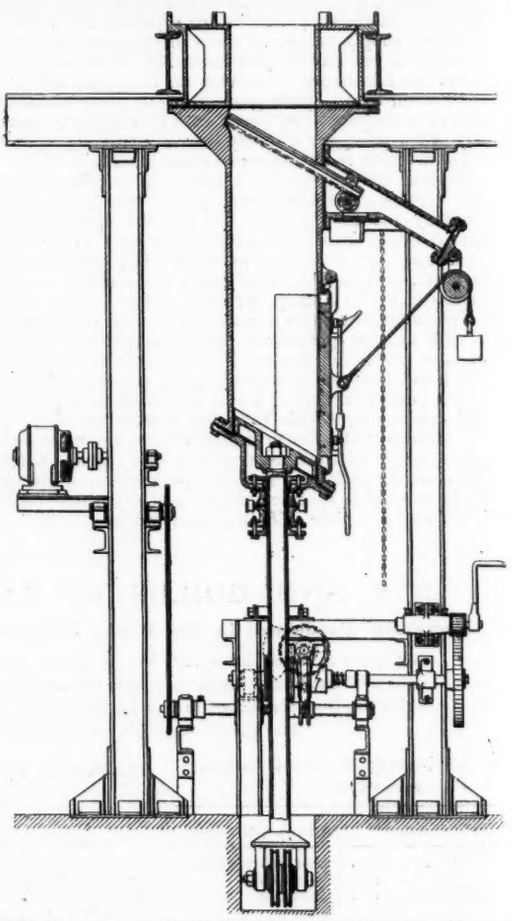
According to the present invention, which is applicable to the "back run" method of water gas making, a single swinging valve is positioned between the port leading from the superheater to the washbox and the port leading from the generator to the washbox, so that either of these ports may be closed by the simple movement of this single valve at the same time the other port is opened. The same means which operate this valve are utilized for operating a second valve which directs the passage of steam either through the superheater or through the generator. The blower pipe passageway to the gas plant generator is at certain times utilized as a passageway for gas from the generator.

Coke Extractors.—No. 254,106.

WEST, F. J. & E., and WEST'S GAS IMPROVEMENT CO., LTD., all of Miles Platting.

No. 16,826; June 30, 1925.

This invention relates to coke extractors for vertical retorts of the type in which the coke is gradually lowered by a descending platform and discharged from the platform, the latter being then returned to its uppermost position, and has for its object to provide an improved type.



Coke Extractors for Verticals.—West's Gas Improvement Co., Ltd.

In the coke chamber beneath a vertical retort, the latter having a steaming chamber at its base, a ram with an inclined upper face is adapted to be vertically reciprocated by suitable means. One side of the coke chamber consists of a door hinged about its upper edge and adapted to be opened by suitable means when required. A locking device secures the door when it is closed. At the top of the coke chamber and to one side thereof is a casing in which is a movable inclined grid having, if desired, rack teeth on its lower side which are engaged by a pinion by which the grid can be moved outwards so that it bridges across the top of the coke chamber and forms a support for the coke when the contents of the coke chamber are being discharged. When the grid is withdrawn, it is completely within its casing and clear of the coke passing down.

The ram during its downward movement determines the rate at which coke is delivered from the retort, such rate being adjustable to suit the speed of carbonization. When the ram reaches the bottom of its stroke, the movable grid is put into position across the top

of the coke chamber, and the door of the latter opened. The coke is then discharged, the door closed, and the ram raised by hand or by power to its uppermost position and the movable grid withdrawn. The cycle of operations is then repeated. The angle of inclination of the movable grid corresponds to that of the ram, so that the latter lies under the former before the grid is withdrawn.

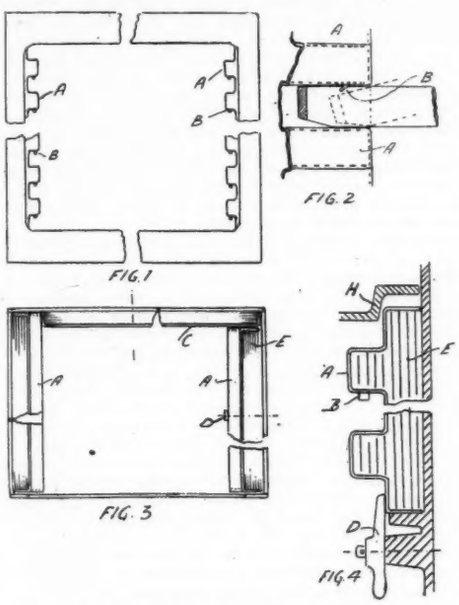
Power-operated means—one form as shown in the reproduced drawing, the other hydraulic—are described and claimed in the specification.

Gas Ovens.—No. 254,118.

FLAVEL, P. W., of Leamington.

No. 18,972; July 25, 1925.

This invention has for its object to provide facilities for easy cleaning and ready examination of gas ovens, and permits of rapid assembly in manufacture and security against accident in use. According to the invention a gas oven is provided with interlocking liners, heat insulating members carried by the liners, and means for releasing the liners by a single operation. Channels may be provided adapted to receive grids or the like, while means are provided for preventing the accidental withdrawal of the grids.



Linings for Gas Ovens.—P. W. Flavel.

Fig. 1 is a front elevation of an oven in which corrugations extend the whole vertical depth of the sides, and have tongues B to check accidental withdrawal of the grids. Fig. 2 illustrates a portion of the grid which, by being cut away at the rear, allows the grid to be freed from the tongue B and to be entirely removed by tilting.

Fig. 3 is a horizontal section of the oven showing the back lining C and the two side linings A. The insulation E of these linings is indicated by parallel lines and may consist of asbestos sheets or the like attached to and removable with the lining.

Fig. 4 is an enlarged vertical section showing the action of a removable lug D holding in position the side lining. It will be seen that the liners are interlocking—*i.e.*, the left-hand lining is kept in position by the back lining, while the back lining is retained by the right-hand lining. The linings are retained in position at their upper edges by a trough piece H.

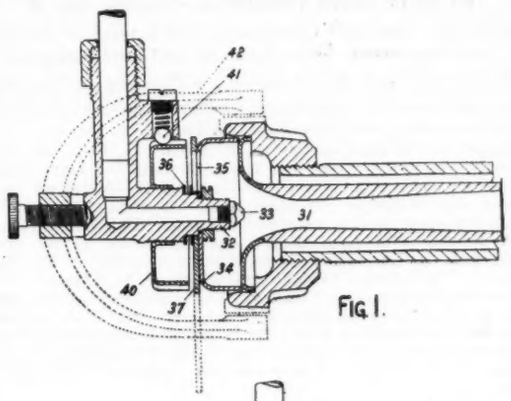
Injectors.—No. 254,128.

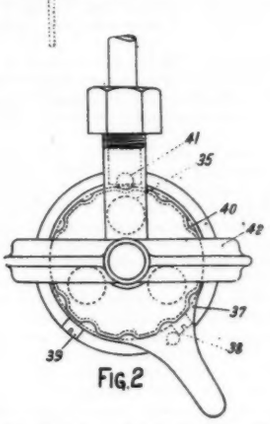
KEITH & BLACKMAN CO., LTD., and KEITH, G., both of Farringdon Avenue, E.C.

No. 19,797; Aug. 6, 1925.

This invention refers to improvements relating to injectors for gas burners for bread and biscuit ovens.

The injector, as shown in the drawings reproduced, includes the usual Venturi throat 31 and a nipple-holder 32. Applied to the nipple-holder 32 is an apertured cap 34 designed to close the entrance to the throat and presenting three air apertures 35. Beyond the cap 34, and pressed thereagainst by a spring washer 36, is a correspondingly apertured shutter 37 movable between two limiting positions defined by stops 38, 39. To regulate the passage of air through the apertures 35, when unmasked, there is threaded on the stem of the nipple-holder 32 a movable cap 40, the spacing of which from the shutter





Injector for a Biscuit Oven.—Keith & Blackman Co., Ltd.

37 determines the size of the air inlet opening. The periphery of the cap 40 is formed with longitudinal grooves engageable by a spring-urged ball 41 serving to lock the cap 40 temporarily in any selected position.

The assembly, comprising nipple-holder, caps, washer, &c., is held to the injector body by means of a stirrup 42 as usual, so that it may be readily taken apart for cleaning, the arrangement being such that dismantling does not disturb the air adjustment.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for July 21.]

Nos. 17,353-17,974.

BATES, A.—"Manufacture of superheaters for gas burners." No. 17,929.
CLARK, F. W.—"Manufacture of water gas." No. 17,881.
DOLPHIN, J.—"Gas taps." No. 17,886.
HOWLETT & Co., LTD., M.—See Dolphin, J. No. 17,886.
MAJOR, P. F. E.—"Coin-freed meters, &c." No. 17,623.
MISCH, O.—"Water gas generator." No. 17,403.
PAMART, C.—"Apparatus for carbonization of combustibles." No. 17,761.
POPE, P. C.—"Apparatus for low-temperature carbonization." No. 17,536.
RADIATION LTD.—See Dolphin J. No. 17,886.
ROZINEK, A.—"Gasification of fuel." No. 17,582.
SZIKLA, G.—See Rozinek, A. No. 17,582.
TRAVERS, M. W.—See Clark, F. W. No. 17,881.
TRAVERS & CLARK, LTD.—See Clark, F. W. No. 17,881.
WILLIS & BATES.—See Bates, A. No. 17,929.
YATES, H. J.—See Dolphin, J. No. 17,886.

Accrington and District Gas Board.—The annual report of Mr. A. J. Harrison, Manager of the Accrington and District Gas Board, states that the total expenditure on revenue during the year was £92,626, and the income £127,354, leaving a gross profit of £34,728. The net surplus was £1767, against a deficit of £1348 for the previous year. The deficit on the net revenue account now stands at £7545. The gas produced was 590,900,000 c.ft. The consumption of gas since 1919 has increased by 183 million c.ft. per annum, equal to 52·3 p.ct. Appliances sold and fixed during the year were: Cookers, 690; fires, 295; wash-boilers, 534; grillers, &c., 34; geysers, &c., 13; total 1566. The cash value of showroom sales amounted to £8908. The appliances fixed since 1919 totalled 7955.

Loughborough Gas Department.—Presenting the annual report of the Loughborough Gas Committee, Alderman G. W. Lloyd James said that the total revenue for the year amounted to £46,540, and the expenditure to £34,039, leaving a gross balance of £12,501. This excellent result could be attributed to the good work of their Engineer and Manager, Mr. Edward Onions, and their staff and employees generally. The sale of gas for the year showed an increase of £460; and there was a new item of £324 for showroom sales. The public appeared to appreciate these showrooms. There was a balance to carry forward of £9273. The gas sold amounted to 651,688 therms—an increase of 9674 therms. The number of consumers, at 6343, showed an increase of 187.

PARLIAMENTARY INTELLIGENCE.

GAS LIGHT AND COKE COMPANY'S BILL.

The Minimum Dividend.

HOUSE OF LORDS COMMITTEE.—Tuesday, July 20.

(*Before Earl* Beauchamp (*Chairman*), *Lord* Stanley of Alderley, *Lord* Templemore, *Lord* Allendale, *and Lord* Biddulph.)

The Bill deals with the finances of the Company. It proposes an increase of borrowing powers, and a minimum dividend of 5 p.ct. on the ordinary stock (see "Journal" for Jan. 20, p. 161).

Counsel for the Bill were Mr. H. P. MacMillan, K.C., Mr. W. E. Tyldesley Jones, K.C., and Mr. Harold Beveridge. There was opposition by the London County Council and the Middlesex County Council, represented by the Hon. Evan Charteris, K.C., and Mr. Rowand Harker, K.C.; the City of London Corporation (Counsel reserved); the West Ham Corporation, represented by Mr. Arthur Moon; and the East Ham Corporation, represented by Mr. Edgar Macassey. Mr. Arthur Valon was advising the London County and the Middlesex County Councils. The opposition was confined to the proposal to fix a minimum dividend, but some of the opponents asked that the Company should justify the granting of the increased borrowing powers. The proceedings followed somewhat the lines of those in the House of Commons (see "Journal" for June 23, p. 666).

Mr. H. P. MacMillan, K.C., in his opening statement, dealt first with the capital position. The issued capital was £25,549,980, and the net effect of authorizing the additional borrowing powers would be to make the total borrowing powers £12,772,990—an addition of £4,230,215.

Since the Bill was in the House of Commons, the Company had borrowed £1,642,770. The present loan capital was £7,881,505. From that there must be deducted £88,730, being the amount of certain monies re-borrowed on July 1 this year, reducing the figure to £7,792,775. There were at present unexercised borrowing powers to the extent of £750,000. The Company had reconstructed their plant, and by attaining greater efficiency had been able to keep pace more or less with the demands made upon them, without having to make large new capital expenditure, and were entitled to claim merit in the respect that they had been able to reduce largely the element which represented capital employed in the undertaking in the charges to the consumer. Whereas in 1900 the capital employed by the Company per 1000 c.ft. of gas represented 12s. 9d., in 1925 that figure had been reduced to 8s. 7d., while the charge for capital represented in the charge made to the consumer per 1000 c.ft. had been reduced from 11·82d. in 1900 to 8·72d. in 1925. That process of overtaking increasing demands by improving existing plant, however, was one which had its limitations, and the Company must, in the immediate future, undertake the construction of entirely new plant. But there were other factors. In 1925 there was at the debit of capital account about £800,000 or £900,000, which really meant that the capital account had been overspent to that extent. Also, when they had taken over the Brentford Gas Company last year, it was found that that Company had overspent on capital account to the extent of over half-a-million, so that the combined undertaking was now overspent in capital account to the extent of about a million and one-third—a sum which was being increased from time to time. One might put down requirements for correcting the account in that respect at somewhere about £2,000,000. In view of the increasing demands upon the undertaking, capital expenditure now being incurred was in the region of about half-a-million per annum. Reckoning on an average increase of about 3 p.ct. in the gas sold over the next few years, this in itself would require an expenditure of over £4,000,000 sterling. Again, £2,422,600 of working capital had been provided from other than capital sources, so that there was a large bank overdraft, in the region of a million and a half. No capital had been raised by the Company since 1901 through the issue of loan or stock capital, notwithstanding the expansion of business. There were a large number of precedents for granting borrowing powers to the extent of half the issued capital. The lease of life for which the Company asked by increasing the borrowing powers would not be such as to absolve them from the necessity of coming back to Parliament for a prolonged period, and the amount asked for would probably be used up in six, seven, or eight years.

Dealing with the minimum dividend on ordinary stock of 5 p.ct., he said it was proposed to arrest the operation of the sliding-scale at the 5 p.ct. point, and to say that below that the dividend should not fall, provided, of course, that the money was actually earned to enable the dividend to be paid. It was not suggested that there should be a guaranteed or a cumulative right to a 5 p.ct. dividend. The present standard price was 11·4d. per therm, with a slide of 1s. 4d. p.ct. per half-year, or 2s. 8d. p.ct. per annum for each 0·2d. per therm above or below the standard. The standard dividend was 4 p.ct. The present price—the lowest at the moment of the three great Metropolitan Companies—was 9·4d. per therm, so that the permissible dividend was £4 *plus* £1 6s. 8d.—*i.e.*, £5 6s. 8d. per annum. From that, a contribution had to be made to the capital redemption fund, to the extent of 5s. 4d., reducing the permissible dividend to £5 1s. 4d. p.ct.

After an explanation of the legislative history of this matter, the effect of the war upon the sliding-scale, and the subsequent legislation, Counsel pointed to the reductions made in the price of gas after the fixing of the standard price at 15·2d. per therm in 1921. The effect of the reductions was that in 1923 the authorized dividend was between 7 and 8 p.ct.; but the Company had carried some of the money to reserve, and had not distributed that large dividend. In 1924 the standard price was reduced to 11d. per therm, but the Company had been able to pay a dividend of just over 5 p.ct. subsequently until the second half of 1925, when, owing to a sudden slump in the price of residuals, it was reduced to £4 17s. 4d. p.ct. The standard price was subsequently raised to 11·4d. per therm, and the Company were again able to pay just over 5 p.ct.

During the fifty years in which the sliding-scale had been in operation, it had never operated to reduce the Company's dividend below the standard, except during the war period. On the other hand, its stimulating operation had been exhibited very markedly, because the Company had been able steadily to improve their dividend position. Before the war it was steadily rising, and by 1912, after provision for redemption, had reached close upon 5 p.ct. In 1913 the authorized dividend was £5 1s. 4d., *less* 4s. to redemption fund—£4 17s. 4d. In the abnormal period of the war it was very low indeed, until it was partially retrieved by the operation of the Temporary Increase of Charges Act, which authorized a 3 p.ct. distribution. Then followed the Order under the Gas Regulation Act, made in 1921, and in 1922 the Company were able to distribute £5 4s. p.ct., and in 1924 £5 6s. 8d., after redemption fund contributions had been paid, and after a contribution to reserve fund in one or two cases. The lapse in the second half-year of 1925, which had brought the dividend down to £4 17s. 4d., was from the point of view of the Company a singularly unfortunate circumstance. It was not justified by any want of efficiency on their part. Through the increased cost of production of gas, the sliding-scale had had the result of decreasing the dividend, and the remedy provided under the Gas Regulation Act, of getting an increased standard price, was belated; it was a remedy which took effect after the loss rather than before.

The Company's justification for the minimum dividend proposal was to be found in several circumstances. They were entitled to say that 5 p.ct. represented a reasonable return on capital in an undertaking of this sort. It was detrimental to the Company, who had large capital and were in the public eye, if their minimum dividend was subject to fluctuation. It was true that under the proposed scheme the deterrent against increasing the price above that which would entitle the Company to pay a 5 p.ct. dividend would be removed, but the justification for this was that the deterrent had been unnecessary in the Company's history. The incentive to reduce the price and increase the dividend above 5 p.ct. was still there. If the Board of the Company were to be satisfied with a 5 p.ct. dividend, and make no effort to increase it by reducing the price of gas, they would not long survive. Another justification for the proposal was the fact that the Company had to face strenuous competition, from electricity and oil, and from coal itself. Further, it would still be open for any local authority within the area of supply, or a number of consumers, to make application to the Board of Trade for revision of the standard price under the Gas Regulation Act. It was not proposed in any way to infringe that safeguard.

Discussing further the operation of the Gas Regulation Act with regard to price revision, he said it had the demerit that a gas undertaking must go to the Board of Trade and make out a case that an increase of costs had arisen. If as a result of this the standard price was increased, it meant that the undertaking concerned was getting something based upon an antecedent state of affairs, restoring the position in which the undertaking should have been all along, rather than preventing it from having sustained the loss or disadvantage which had been sustained. This drawback could not have better illustration than it had last year, when, due to the slump in prices of residuals, the Company were compelled to pay less than 5 p.ct., though they had earned it, simply because they could not get the Board of Trade application in quickly enough, and could not get it disposed of quickly enough.

Counsel then drew attention to the basic price and basic dividend scheme of the South Metropolitan Gas Company, which was approved by Parliament in 1920 coincidently with the passing of the Gas Regulation Act. That scheme differed from the one now proposed by the Gas Light and Coke Company. The former Company had been set free from the operation of the sliding-scale, except that the lower the price charged, below the basic price, the more could be divided between shareholders, consumers, and co-partners. One of the disadvantages of the method was that the Company could not tell what the actual dividend was going to be until the end of the year. On the other hand, the method of the Gas Light and Coke Company provided a means of knowing in advance what the dividend payable for any half-year would be. Consequently, they would have a better market position. The South Metropolitan Company's Bill of 1920, in which their new scheme was put forward, was opposed strenuously by the London County Council and other bodies, one of the chief objections being that the Gas Regulation Act was then on the stocks, and that it was undesirable that the Company should have a code of its own. However, after careful examination, Parliament approved, with the proviso that in five years the Company should come to Parliament again to give an account of its stewardship during that period. In 1925, therefore, the scheme had been further examined, in the light of the five years' experience; and, though there was opposition, Parliament had given the Company a further lease of ten years. The South Metropolitan Company had established to the satisfaction of Parliament that the minimum dividend system was a suitable system.

The South Metropolitan Company had asked for a minimum dividend of 6 p.ct. on their capital, but Parliament had granted 5 p.ct. on existing capital and 6 p.ct. on new capital. The present scheme of the Gas Light and Coke Company did not propose to alter the standard dividend, but to leave it at 4 p.ct., and that the minimum

dividend distributable should be 5 p.c. after contribution to redemption fund, which meant about £5 4s. p.c. The concession of a minimum dividend would greatly improve the Company's financial position, and render the raising of capital correspondingly easier. Another element was the co-partnership scheme, by which the employee co-partners received a bonus on wages, the bonus being dependent on the dividend paid to the shareholders. Three-fourths of the bonus was invested in the Company's stock, and the employees received dividends on their stocks, so that twice over they were interested in the percentage return fixed.

Since 1920 minimum dividends had been granted to the Gas Companies at Cardiff, Swansea, Chester, Sheffield, and Windsor; the minimum being 5 p.c. in the case of the first four, and 10 p.c. in the case of Windsor, presumably because the stock in the latter instance was of larger denomination. The principle was also adopted last year in the Electricity Bills dealing with the London electricity supply.

Mr. *D. Milne Watson* (Governor and Managing Director of the Company) gave evidence, and, in the first place, corroborated Counsel's opening statement with regard to borrowing powers, and the need for further expenditure. [The opponents, however, did not continue their opposition with regard to the amount of capital asked for.] When the sliding-scale was applied, the Company had practically a monopoly, and there was no competition. The consumer had no protection, except the sliding-scale. The consumers to-day, however, had the great protection of competition from other sources of light and heat; and in order to get business, the Company must quote low prices. In addition, there was a vigilant Press. Various improvements in working had been effected; and if the war had not occurred, and the Company had been working under the sliding-scale, they would have been able to reduce the price of gas to such an extent that they might have been able to distribute a 5½ p.ct. dividend. After the passing of the Company's Order of 1921, under the Gas Regulation Act, and before the subsequent reduction of the standard price, the Company could have paid higher dividends than they did, because, until the revision took place, they were working under a sliding-scale, which, had they taken full advantage of it, would have enabled them to pay a dividend of £8 8s.; but only £5 14s. 8d. was distributed between the shareholders and the redemption fund. The standard did require revision, and it would not have been wise to pay a dividend which could not be maintained.

Witness agreed that a minimum dividend of 5 p.ct. was a fair minimum to ask Parliament to authorize. As a matter of fact, even with the hope of a £5 1s. 4d. p.ct. dividend, the stock stood at only 83. Dealing further with the point that delay was involved in raising the standard price in consequence of increased costs, by an application to the Board of Trade under the Gas Regulation Act, he said that until the Company knew the extent of the damage, it was no use applying to the Board. Last year, when the slump in residuals occurred, the Company waited to see what the effect was going to be before applying. They applied in November, the Board heard them in March, and the Order was made in June. In the meantime, the damage was done—*i.e.*, the dividend had been reduced, the value of the stock had been reduced, and, so to speak, there had been a blow at the confidence of the public in the stability of their stock. If the capital was unstable, it was more difficult to raise it on an advantageous basis, and this reflected upon the price of gas. If the ordinary stock stood well, the debenture stock also would stand well. Debenture stock had been issued since this Bill had passed the House of Commons, and he had been told that, had the Bill not been approved by the House of Commons Committee, the Company would not have got such a good price for the issue of that stock.

The point made by the opponents, that the proposed scheme removed the deterrent applied by the sliding-scale against increasing the price, assumed that the Directors were going to be satisfied with a 5 p.ct. dividend; but they would not be satisfied with it. The incentive to pay higher dividends by reducing the price of gas was strong enough to induce good management.

Wednesday, July 21.

Mr. *Milne Watson*, continuing his evidence, discussed the bearing of the minimum dividend proposal upon the Company's co-partnership scheme. On June 30 of this year the stock held by co-partners amounted to £525,330, and out of 19,000 employees, 15,000 were co-partners. Of the remainder, some were under 20 years of age, some were temporarily employed, while others, having less than one year's service, were ineligible. If the men could be assured of a certain minimum return on their stock, they would be more inclined to increase their stake in the Company, to the benefit of all concerned, including the consumers.

Reference was then made to an argument put forward by Mr. Arthur Moon (for the West Ham Corporation) in the House of Commons proceedings. He had pointed out that the South Metropolitan Company in 1920 had asked Parliament for a minimum dividend of 6 p.ct. on their capital, but Parliament had given them 5 p.ct. on the old and 6 p.ct. on the new capital, though prior to the war the Company had paid 5½ p.ct. on ordinary stock. Therefore, it was suggested, that, as Parliament had knocked off ½ p.ct. in that case, it should do so in the case of the Gas Light and Coke Company. Witness pointed out that in this case there was a standard dividend of 4 p.ct., which would still apply, whereas in the South Metropolitan instance there was the equivalent of a 5 p.ct. standard dividend. The Gas Light and Coke Company would only be able to increase their dividend above 5 p.ct. when they had reduced the selling price below 9·6d. per therm; but the South Metropolitan Company could pay over 5 p.ct. when the selling price was anything below 11d. per therm.

Mr. EVAN CHARTERIS, K.C., cross-examining on behalf of the London County Council and Middlesex County Coucil, said that the effect of the scheme was to lop off the deterrent side of the sliding-scale when the selling price had reached the point at which it produced a 5 p.ct. dividend.

Further questions were directed to show that the case of the South Metropolitan Company, having regard to all the circumstances, was no precedent for what the Gas Light and Coke Company were now asking. In 1920, when the South Metropolitan Company had obtained Parliamentary sanction for their scheme, the selling price of gas, and the working expenses, had more than doubled as compared with pre-war, while the Company's stock had stood at about 50.

Mr. *Milne Watson* pointed out that so also did the stock of the Gas Light and Coke Company.

COUNSEL agreed, but said it had no bearing upon the present discussion. Continuing, he said that in 1920 the South Metropolitan Company urgently needed to raise about £3,000,000 of capital, they had an overdraft of £1,000,000, the arrears of the war had to be made up, and the authorized dividend under the sliding-scale was £1 9s. 4d. p.ct. That was a state of affairs very different from that of the Gas Light and Coke Company to-day. A further material point was that in 1920 there was no machinery for dealing with the sliding-scale, except the temporary legislation connected with the increase of statutory charges, whereas to-day the matter could be dealt with under the Gas Regulation Act.

Witness pointed out that in 1925 the South Metropolitan Company had had their basic dividend powers extended for a further ten years, though the Gas Regulation Act was in operation.

COUNSEL suggested that the Company should not be immune from the effects of industrial crises, such, for instance, as the coal strike, by the operation of the minimum dividend, any more than an ordinary industrial concern was immune from those effects. If the scheme were allowed, the Company could snap their fingers at a crisis.

Witness disagreed with this view, and pointed out that the minimum dividend could not be paid unless there were sufficient money earned to pay it. Also, the Company's activities were controlled by Parliament.

COUNSEL then suggested that under the proposed scheme the Company could continue to increase the price of gas, while the happy shareholders would receive their minimum dividend.

Witness said he was trying to help the consumer as much as anybody else by his scheme.

Mr. EDGAR MACASSEY (for the East Ham Corporation) adopted Mr. Charteris' cross-examination.

Witness, re-examined, agreed that the Gas Regulation Act was designed to protect statutory gas companies from instability brought about by economic fluctuations; and in so far as it had not achieved that protection, it had failed of its purpose.

Sir *William Plender* (Messrs. Deloitte, Plender, Griffiths, & Co., Chartered Accountants) gave evidence in support of the Bill, and said that the suggested scheme would benefit consumers as well as the Company and their co-partners. Capital in an undertaking such as the Gas Light and Coke Company should have its rights recognized; and having regard to the character of the Company, he was of the opinion that 5 p.ct. would be a fair minimum. No Board of Directors would expect to remain in office or to retain the confidence of the shareholders if they stereotyped a dividend of 5 p.ct. He had advised in connection with the Bills dealing with the London electricity supply last year, in which the minimum dividend principle had been relied upon. He agreed that in practice a company could not apply for a revision of its standard price under the Gas Regulation Act until loss had been suffered, and added that a company must wait a reasonable time to ensure that the causes leading to the application were not merely transitory.

Cross-examined by Mr. ROWAND HARKER (for the London County Council and the Middlesex County Council), he admitted that he knew of no case in which Parliament or the Board of Trade had authorized a minimum dividend to a Company operating under the ordinary sliding-scale. The South Metropolitan Company operated on a scale which was called—perhaps not correctly—a sliding-scale.

COUNSEL suggested that the case of the Electricity Bills was not comparable with the case of the Gas Light and Coke Company.

Mr. ARTHUR MOON cross-examined on behalf of the West Ham Corporation, and pointed out that when investors had bought the Company's ordinary stock, they had done so on the understanding that, if the price of gas was increased above a certain figure, the dividend would be reduced below 4 p.ct., and not on the understanding that there should be a minimum of 5 p.ct.

Witness replied that the investor was more concerned with the possibility of getting an increased than a decreased dividend.

Mr. *Lawrence Currie* (a Managing Partner of Messrs. Glyn, Mills, & Co., who have been bankers to the Company for nearly 100 years, and who is President of the Bankers' Association) said that prior to the war the Company's stock was considered to be very good. Stability was an important factor. The result of the war-time experience, which had knocked the bottom out of the sliding-scale, had been to make the investing public very uncomfortable about gas stocks. If the Company could be secure in their ability to pay a dividend of 5 p.ct., their prestige would be increased in the market when they sought to raise more money.

Thursday, July 22.

Mr. *Charles Henry Whittington* (Senior Partner, Messrs. C. J. Whittington & Co., Stockbrokers) said that his firm were one of the largest dealers in gas stocks, and agreed with previous witnesses as to the ill-effects of the reduced dividend last year resulting from the fall in prices of residuals. A minimum dividend was valuable when raising money; and he considered the present proposal a wise one.

This concluded the evidence. No witnesses were called on behalf of the opponents, Counsel contenting themselves with their addresses to the Committee.

The points raised have already been dealt with more or less in the cross-examination of witnesses. The point was made, however, that whereas the Company were asking for a minimum dividend with a view to securing stability in the financial market, it was proposed to

raise money in a manner which would not be affected by the question of stability—namely, by borrowing. It was also held that the flexibility of the Gas Regulation Act was such that it enabled the Company's end to be achieved without the proposed minimum dividend scheme.

THE COMMITTEE'S DECISION.

After consultation in private, the Committee decided that the Bill be allowed to proceed, subject to the insertion of a proviso that it should be within the power of local authorities in the area of supply, at the expiration of five years, and of subsequent periods of five years, to apply to the Board of Trade for an Order reducing the minimum dividend or doing away with it altogether. Such an Order should be subject to Parliamentary approval, in the same way that Special Orders had to be approved. The Board of Trade would be able, on the application of a local authority, to review the whole circumstances.

In reply to a question, the CHAIRMAN said that if no local authority applied to the Board of Trade for revision under the terms of the proviso, the scheme would remain as set out in the Bill.

It was pointed out by Mr. ROWAND HARKER, K.C., that the London County Council and the Middlesex County Council were not local authorities in the ordinary sense, but they were local authorities within the meaning of the Gas Regulation Act. He asked, therefore, that it should be made clear in the proviso that local authorities within the meaning of the Gas Regulation Act should have power to appeal to the Board of Trade.

The CHAIRMAN agreed.

HOUSE OF LORDS.

Progress of Bills.

Chorley Corporation Bill: Returned from the Commons, agreed to, with amendments, which were considered and approved.

Swindon Corporation Bill: Read a second time, and committed. Reported, with amendments.

Special Orders.

Birkenhead Corporation Gas Order and Haslemere and District Gas Order: Report from the Special Orders Committee that no petition had been presented against these Orders, and that there was nothing in them to which they thought it necessary to call the attention of the House.

HOUSE OF COMMONS.

Newcastle-upon-Tyne Corporation Bill: Read a second time, and committed.

Mynyddislwyn Urban District Council Bill: Lords amendments considered, and agreed to.

Ammonium Sulphate.

Lieut.-Commander KENWORTHY asked the President of the Board of Trade what percentage of the ammonium sulphate manufactured in Great Britain in 1925 was produced as a bye-product in gas-works, &c., and what percentage was produced by synthetic methods.

Sir P. CUNLIFFE-LISTER replied that he regretted he had not the information.

MISCELLANEOUS NEWS.

DR. CHARLES CARPENTER ON CO-PARTNERSHIP.

South Metropolitan Gas Company's Festival.

An event which is always looked forward to, both by those who are active participators in the scheme and by those who attend as invited guests, is the Annual Co-Partnership Festival of the South Metropolitan Gas Company. The procedure which has been followed during recent years has met with such general approval that it was once again adopted for the 1926 festival, which was held on Saturday last, at the Crystal Palace. For this occasion between 9000 and 10,000 tickets were issued to co-partners and their wives, and to children who took an active part in the proceedings; and to the onlooker it was evident that there were not many tickets unused.

During the afternoon, in the boating lake and in the Palace grounds, there was carried through a full sports programme, the Organizing Secretary of which was Mr. A. Coleman. Mr. A. E. Bickerton acted as Hon. Sports Secretary, with Mr. J. W. Morfill as Swimming Hon. Secretary. On the sports ground Mr. F. Day officiated as Referee—a service which was rendered on the boating lake by Mr. J. H. Kimber. In all there were upwards of thirty events, which were well contested by competitors many of whom had already to their credit successes on previous similar occasions. The South Metropolitan Gas Company's Military Band (conducted by Mr. Sydney Herbert) played selections during the day. Tea closely followed the conclusion of the sports; and after this all made their way to the centre transept, where the co-partnership meeting was held.

Dr. CHARLES CARPENTER, C.B.E. (the President of the Company), was in the chair, and was supported by his colleagues on the Board—of whom there were noticed present Messrs. Frank H. Jones, Frank Bush, A. M. Paddon, E. Honoratus Lloyd, K.C., B. R. Green, P. Richbell, and C. H. G. Belben. The chief officers who were present included Messrs. Frederick M'Leod (General Manager), F. Day (Secretary and Accountant), R. C. Macdonald (Chief Mechanical Engineer), E. V. Evans (Chemical Products Manager), T. Curr (Engineer at East Greenwich), A. H. Andrews (Engineer at Vauxhall), Leonard M'Leod (Engineer at Rotherhithe), H. W. James (Manager of the Ordnance Wharf Tar Works), and A. Stokes (Gas Supply Manager).

THE ADDRESS.

Dr. CARPENTER addressed the meeting as follows:

Ladies and gentlemen,—It is a noteworthy circumstance that, at a time when the life blood of industry in this country is slowly but surely ebbing away, owing to a stoppage of work by over one million workers in the coal mines, and, too, while we are only a few weeks removed from a general strike which had for its object the stoppage of the nation's food and personal transport—it is, I say, remarkable that at such a time several thousand representatives of Capital and Labour should be holding a festival meeting in celebration of their co-partnership in business.

The remarkable character of such a gathering must be all the more striking when it is remembered that it is by no means a unique occurrence, but only one of many which have taken place since that co-partnership first came into being, now nearly thirty-seven years ago. That date, I think, sets its seal upon this Company as being the oldest—the pioneer, in fact—of all the co-partnership gas undertakings, large and small. And a pioneer among them it continues to-day—the leader, carrying the banner of co-partnership at the head of its contemporaries.

WHAT IS CO-PARTNERSHIP?

Now what is this co-partnership that we talk about, and what has it achieved? I will tell you. Many representative men have for many years past voiced the claim that those employed in industry should receive therefrom not only the wages customarily paid for their labour, but, in addition thereto, a share in the responsibilities and in the profits of the particular undertaking they serve. Now, in the year 1889, the Board of Directors of the South Metropolitan Gas Company took the first step in this direction of sharing profits, by paying a premium or bonus on wages based upon cheap production. If costs went down, the bonus went up, and *vice versa*. At the same time, there was created a Committee composed of employees elected by ballot with an equal number of representatives nominated by the Board, and that Committee was charged with the duty of putting these proposals into practice. Later on it made arrangements by which not only employees' bonuses, but their savings as well, could be allocated for the purchase of shares in the undertaking, identical with those held by the ordinary shareholders. The next step forward was to extend still further the privilege of shareholding, by giving to employees holding stock—in other words, the co-partners—the right to elect by ballot their own representatives to the Board of Management. During the twenty-eight years this practice has been in operation, twelve employees selected by, and from, the employees have been members of the management, performing the same duties, and sharing the same responsibilities, as their colleagues.

THE MATERIAL ADVANTAGES.

So much, then, for the idealistic achievement of co-partnership. What have been the material advantages pertaining thereto? There has been paid in co-partnership bonus since the scheme was started over £1,000,000 sterling; and to-day more than £520,000 of stock is held by our employees. And this stock is the absolute property of the workers—just as is mine or that of any other shareholder. During all this period South London has been supplied with cheap gas, always of the full quality, and always available night and day to the consumer, come storm or sunshine, for we have been free from all disturbance by industrial unrest. Any minor difficulties we may have had at one time or another have always been small, and certainly of a friendly character. What is there, I ask, special about our work which places us in this position so different from that where the spectre of strikes, official or unofficial, haunts the railways, or the mines, or transport, or the building trade, and so many other of our vital industries? Nothing whatever, ladies and gentlemen. Our employment comprises workers in all those occupations, and many others besides. And co-partnership principles could be applied to all or any of these other industries outside our own business, with the same success that they have achieved in our own case. Is a railway likely to be less or more efficient if the railway men themselves and individually have a holding in railway stocks? Would a miner be likely to work less or more efficiently if he felt he was sharing with Capital in the profits and responsibilities of ownership? There is but one single answer to that question, and the great meeting here to-day gives it.

CHEERFULNESS IN LEAN YEARS.

There have been times in the past when our profits fell so low that there were none in which you could share. But did this lessen your faith in the soundness and equity of the co-partnership principle, or the faith of any of my colleagues on the Board therein, or of the shareholders they represent? Not for one moment! We all worked cheerfully together to correct the losses brought about by unavoidable circumstances in years of leanness. This spirit translated into every-day life is the only one which will enable us to keep our coun-

try, not only in the van of the nations, but from falling behind those more fortunately situated. Take, for instance, this matter of coal. We have had to buy, in order to keep up our supplies of gas, foreign coal at a cost of something like half-a-million sterling—money which should have been spent for this country's own support, instead of being sent abroad. And please do not be deluded by a belief that the coal is inferior to what is produced over here; for that is not the case. It is better in quality than any I am aware of mined in this country, and it is supplied freer from impurities. It is heart-breaking, to think that, at a time when every resource the nation possesses is urgently needed, trade is being lost, much of which will never return, because Capital and Labour seem to prefer fighting together to working together.

PASS ON THE GOOD TIDINGS.

In conclusion, let me say that one of the disadvantages of the large scale on which industry must be carried on nowadays, in order to be economical, is that employer and employed meet face to face so rarely. All the more, therefore, do I and my colleagues value the opportunity given to us by this annual festival for taking a little holiday together. It is up to you to do all that you can to strengthen the co-partnership within our gates, by earnest working and the economic use of all materials passing through your hands. This much, at least, you owe to the Company that has helped you so whole-heartedly and so enthusiastically in the achievement of those great ideals which have been voiced on your behalf. But as citizens of this vast city—indeed, as people of our great empire—you have a higher duty still to fulfil—that of passing on a knowledge of the blessings you have enjoyed, and of the principles which have brought them into being, to those less fortunate workers than yourselves, who have not yet ranged themselves, or perchance have not yet been allowed to range themselves, under the stirring banner of co-partnership.

Dr. Carpenter then presented the prizes to the successful competitors in the afternoon's sports; and there was an excellent display of Swedish drill and special dancing (under the direction of Mr. A. Coleman and Miss N. Webber), which concluded with a parade of successful competitors and a tableau showing various sections of sport catered for by the "Metrogas" Amateur Sports Association.

A thoroughly enjoyable day was brought to a close with a dance programme by the South Metropolitan Gas Company's Co-Partnership Orchestra.

CARLISLE GAS DEPARTMENT.

In his eighth annual report on the Carlisle gas undertaking, Mr. J. E. Blundell, the Engineer and Manager, mentions that since the date of his last report the village of Cumwhinton has been added to the list of consumers; and this addition, together with extensions made to supply new houses erected in and around the city, has increased the main mileage during the year by 5 miles—the total main mileage now being 105 miles, and the total gas supply area 122 sq. miles. The increasing demand for gas, arising through extensions to neighbouring villages, the erection of new houses in the city, and other causes, has rendered the existing gas storage totally inadequate. Consequently new ground adjoining the works has been acquired for the erection thereon of a new holder of the spiral-guided type, with a capacity of 2 million c.ft. The work (which will cost about £40,000 and which should be completed during 1927) will be commenced early this year.

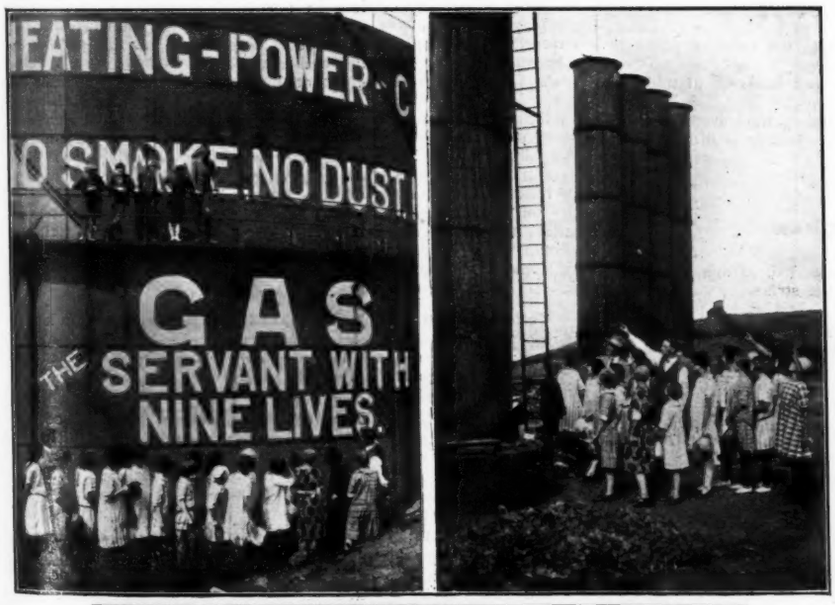
During the year under review, Mr. Buck, the late Chairman, was obliged, owing to ill-health, to relinquish the Chairmanship of the Gas Committee, a position he had held for a period approaching twenty years. The zeal Mr. Buck displayed in the advancement of the gas-works, remarks Mr. Blundell, won for him the admiration and respect of all connected with the undertaking.

Last year's gas output figure, which stood as the record in the history of the undertaking, has this year been exceeded by 36,464,000 c.ft. The total gas made for the year was 528,621,000 c.ft., representing an increase of 27·18 p.ct. in three years, and 7·4 p.ct. on the previous year's output. The net profits for the year were £6904. The average price of gas was 3s. 6·68d.

The numbers of gas appliances fixed over the years 1925-26 and 1924-25 are:

—	Fires.	Cookers.	Grillers.	Radiators.	Irons.	Water Heaters.	Pendants.	Totals.
1925-26	969	973	17	4	47	385	7	2402
1924-25	768	996	19	9	..	290	10	2092

The number of cookers out on March 31 this year was 7126, compared with 6309 on the same date last year—an increase of 817.



SCHOLARS' VISITS TO GAS-WORKS.

Over twenty years ago—on Oct. 3, 1905, to be precise—there appeared in the columns of the "JOURNAL" particulars of a scheme of visits to the gas-works by the older boys of the elementary schools in the Longwood Gas Company's area. In one year there were six visits, and altogether about 160 scholars were conducted round the gas-works in connection with them. Prizes were awarded to the scholars submitting the best essays in connection with their visits. Since then the idea of instructing the young mind in regard to gas matters has been slow of extension until recent years. The Fairy Gas Competition of the British Commercial Gas Association has done much to stimulate the interest of juveniles, and that competition is being more often supplemented by scholars' visits to gas-works. Here are pictures of one such visit to the Penistone Gas-Works. The use of the gasholder for advertising will be noted in one illustration—a phase of propaganda in which the Penistone Gas Company is, we believe, the pioneer.

COAL TRADE IN THE MIDLANDS.

From Our Local Correspondent.

The tension has been sensibly relieved in the Midlands. Apart from the reinforcements that are coming in from abroad, there has been a perceptible augmentation of the district output. Consumers and dealers are warned by prosecutions that the control is not nominal. There is, however, less difficulty in meeting the industrial demand, reduced as it is in the heavy industries by the closing-down of works.

All the Warwickshire pits are working; some being almost fully manned, others having only a nucleus of labour. At the time of writing, the number of men who have returned is between one-third and one-half the strength in April. They are working the eight hours day except at Pooley Hall, where men were signed on at the old terms earlier in the conflict. At Cannock Chase the response of the union men has been slower; but a start has been made at some of the pits where coal had been hewn and not brought to bank, and there is a prospect of freer working. An increasing supply is coming forward from Staffordshire pits. From one outcrop in North Staffordshire, between 1500 and 2000 tons a week are being marketed, and elsewhere substantial tonnages are realized. This outcrop coal is playing a great part in keeping industry alive.

Some of the gas undertakings in the district are having recourse to American coal. Fairly large consignments of Silesian coal are arriving in the Midlands. Many industrialists complain that fuel costs are too high to make it worth their while to continue the struggle.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Foreign coal is available in sufficient quantities to satisfy the requirements of public utility works for a long time to come. The Government having bought a considerable tonnage of American and Silesian coal, there is no apparent shortage of fuel.

Prices vary in accordance with the time of shipment. There is congestion at various points on the East Coast, and this is adding to the cost.

The various fuels imported appear to be giving general satisfaction as compared with British coals.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

London, *July 26.*

The position of the tar products market is firm. The demand for road tar continues, and, owing to short production, some buyers are finding difficulty in obtaining supplies.

Prices are rather firmer.

There is little business being done in pitch, the value of which is nominal between 80s. and 90s. per ton.

Creosote is steady at about 7⅞d. per gallon, in bulk, at makers' works.

Ninety per cent. benzole, 90 p.ct. toluole, and 95/160 solvent naphtha are steady at about 2s. 3d. per gallon. Pure toluole is firm at from 2s. 6d. to 2s. 9d. per gallon.

Pyridine is steady at about 20s. per gallon.

Tar Products in the Provinces.

July 26.

The markets for tar products continue neglected, as manufacturers decline to quote during the continuance of the strike.

There has been some demand from the Continent for pitch; but business has been impossible at prices asked by dealers.

Creosote oil remains firm, and there is a good deal of demand for home consumption.

Benzole and solvent naphtha are both in strong demand, and very little is available. Heavy naphtha has improved slightly in sympathy with solvent naphtha.

Anthracene and naphthalene are neglected.

Tar acids are quiet.

The average values for gas-works products during the week were: Gas-works tar, 61s. to 66s. Pitch, East Coast, 87s. 6d. to 90s. f.o.b. West Coast—Manchester, 82s. 6d. to 85s.; Liverpool, 85s. to 87s. 6d.; Clyde, 88s. to 89s. Benzole, 90 p.ct., North, 1s. 11d. to 2s.; crude, 65 p.ct. at 120° C., 1s. 4d. to 1s. 5d., naked at makers' works; 50-90 p.ct., naked, North, 1s. 11d. to 2s. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal-tar crude naphtha, in bulk, 9d. to 9¼d. Solvent naphtha, naked North, 1s. 9d. to 1s. 10d. Heavy naphtha, North, 1s. 1d. to 1s. 2d. Creosote, in bulk, North, liquid, 6¼d. to 6⅝d.; salty, 6⅜d. to 6¼d.; Scotland, 6d. to 6¼d. Heavy oils, in bulk, North, 7¼d. to 7½d. Carbolic acid, 1d. 4d. to 1s. 5d. prompt. Naphthalene, £11 to £14; salts, £4 10s. to £5, bags included. Anthracene "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Dearer Gas at Blackpool.—The price of gas in Blackpool has been increased from 2s. 8½d. to 3s. 1½d. per 1000 c.ft. The coal dispute has involved the increased cost of £10,000 for foreign coal.

Skipton Gas Undertaking.—A loss of £360 on the year was reported to the Skipton District Council last week in respect of the gas undertaking; and the Chairman (Mr. J. Mallison) said that, unless there was a speedy settlement of the coal dispute, it was likely there would be a further loss next year unless an increase was made in the price of the gas supplied. The profit on the year had actually been £4655, but capital charges were £5015.

CONTRACTS OPEN.

Renewal of Retorts.

Tenders are invited by the Milton Regis Urban District Council for the renewal of one bed of six retorts. [See advert. on p. 219.]

EXTENSIONS.

The Burntisland Town Council have decided to spend £14,000 on a reconstruction scheme at the gas-works, including the installation of vertical retorts.

The Shipley District Council Gas Committee are inviting tenders for the supply of a carburetted water gas plant of 500,000 c.ft. per day capacity. The Committee have been considering also the reconstruction of the carbonizing plant; but this question has been held in abeyance for a time. Both matters will be subject to discussion at the next meeting of the District Council.

TRADE NOTES.

Ownership Change.

Lighting Trades Limited have acquired the business of Messrs. J. & W. B. Smith, Ltd., of 15-23, Farringdon Road, E.C. 1. The businesses will continue as separate concerns.

New Plant for Saffron Walden.

The Saffron Walden Corporation have placed orders with Messrs. Robert Dempster & Sons, Ltd., of Elland, for a two-lift spiral-guided gasholder, fitted with "Elland" patent ball carriages, and "Elland" rails, in a steel tank 64 ft. 9 in. diameter by 27 ft. deep; a cast-iron tar tower; a cast-iron water condenser having a capacity of 350,000 c.ft. per day; a Livesey washer of a capacity of 500,000 c.ft. per day; an oxide shed; and three purifiers, 15 ft. square by 5 ft. deep, fitted with patent reversible valve to each purifier

Clayton Tar Plant for Diss.

Messrs. Clayton, Son, & Co., Ltd., are supplying one of their patent cascade system continuous tar dehydration plants to the Diss Gas Light and Coke Company, Ltd., to deal with 3 tons of crude tar per 24 hours. They have also received an order from a Dutch firm of tar distillers for a cascade system continuous tar distillation plant having a capacity of 40 tons per 24 hours. This latter order was placed after the distillers had inspected several types of plant and studied carefully about 40 different patents connected with the continuous treatment of tar.

Coventry Gas Undertaking.

Considerable growth in the consumption of gas is shown in the annual report of the Coventry undertaking, which states that the gas made during the year ended March 31 was 2322 million c.ft., as compared with 2173 millions in the previous year—an increase of nearly 7 p.ct. The gas sold was 2188 million c.ft., and constituted a record for the undertaking. It exceeded the figure for 1913-14 by 1129 million c.ft., showing an increase of over 106 p.ct. in twelve years. Gas unaccounted-for amounted to 4·43 p.ct.; whereas the figure in 1924-25 was 6·15 p.ct. The capital account shows an expenditure for the year of £26,817 on buildings, mains, and services, which sum was provided from revenue. Adding £1800 for land at Foleshill, the total capital expenditure was £28,617. The revenue account shows a gross profit of £84,170, as compared with £68,688 for the previous year; and after deduction of loan charges, expenditure on new stoves and public lamps, and contributions to capital outlay, there is a net profit of £4271 carried to the appropriation account. The final result is a disposable balance of £3786, which the Committee recommend be carried forward.

Tottenham District Light, Heat, and Power Company.—Dividends in respect of the half-year ended June 30 have been declared at the following rates, less income-tax, per annum: 5 p.ct. preference stock, 5 p.ct.; 5½ p.ct. preference stock, 5½ p.ct.; "A" stock, 7⅛ p.ct.; "B" stock, 6⅛ p.ct. They are payable on Aug. 12.

Pitlochry Gas Light Company.—A satisfactory balance-sheet for the past year was submitted at the annual meeting of the Pitlochry Gas Light Company. The net profit for the year was £958, of which £500 was applied to the payment of the usual 10 p.ct. dividend. About £300, it was explained, will be expended in installing new retorts and laying new pipes.

Leeds All-Gas Bungalow.—It was reported to the Leeds Corporation Gas Committee, on July 20, by Mr. C. S. Shapley (Gas Engineer and General Manager) that 35,000 had visited the all-gas demonstration bungalow set up near the Town Hall for the Tercentenary Celebrations Week. The bungalow was kept open after the week; and as there were a further 2000 visitors on Monday, July 19, the Committee have decided to keep the bungalow open for an indefinite period—so long as public interest is maintained to any considerable extent.

Agricultural Show at Harrogate.—The Yorkshire Agricultural Show, which has just been held in Harrogate, was a big success, and attracted large crowds from the whole of the county. The Harrogate Gas Company laid a special main on to the ground and supplied gas for the whole of the cooking required for the show, loaning cooking appliances to the caterers for that purpose. In addition, they had a special stand where a display of modern appliances was given. This stand was divided into the three sections of cooking, gas fire heating, and water heating, and attracted much attention. Another display was by Messrs. W. H. Leggett, of Silver Street, Halifax, who exhibited a superheated steam sterilizer, heated by gas, for dairy utensils. Superheated steam, it was pointed out to inquirers, can be generated within 15 minutes from lighting the gas flame, and complete sterilization takes only 10 minutes.

STOCK MARKET REPORT.

GENERALLY speaking, all markets last week were in a depressed state. The panic over the franc, and the doubts as to the prospects of an early settlement of the coal difficulties, accentuated the depression. Home Government stocks, however, remained firm throughout.

Transactions in the Gas Market were much heavier than usual. It will be seen from the Table that the stocks of four companies have been marked down *ex* div., and that there is the unusual event of a rise in the quotations of the Wandsworth Company's stocks after having been marked down *ex* dividend only the previous week. The fall of 8½ points in the Imperial Continental stock is significant.

On Friday last the House of Lords Committee approved the preamble of the Gas Light and Coke Company's Bill. This assures the passing of the Bill, which by its provisions for a minimum dividend will have an important bearing on the value of gas investments in anticipation of further legislation.

The following dividend announcements have been made: Commercial, £5 6s. 8d. p.ct. per annum on the 4 p.ct. stock and £5 3s. 4d. p.ct. per annum on the 3½ p.ct. stock, being at the same rates as the corresponding half-year; Gas Light, £5 1s. 4d. p.ct. per annum, against £5 6s. 8d. p.ct. per annum; and Tottenham a rise of 5s. p.ct. per annum to £7 12s. 6d. and £6 2s. 6d. p.ct. per annum on the "A" and "B" stocks respectively. The Continental Union is recommending the payment of 1 p.ct. for the year to June 30.

The following transactions were recorded during the week:

On Monday, Alliance and Dublin 78¾, 78⅞, 79½, Brighton and Hove "A" 132, 132½, British 101½, 102, Commercial 4 p.ct. 78, Continental Union 27, European 4⅛, 5, Gas Light and Coke 83½, 83⅝, 83¾, 4 p.ct. preference 76, Imperial Continental 119, 120, Primitiva 9s. 9d., 9s. 10½d., South Metropolitan 93, 93½. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99.

On Tuesday, Bournemouth 5 p.ct. 12½, 7 p.ct. 12½, 12⅝, 6 p.ct. preference 11½, British 102, Colombo 29s., 29s. 6d., 7 p.ct. preference 20s. 9d., 21s. 3d., Continental Union 27⅛, 27¼, 27⅛, 27⅝, 28, European 98s. 9d., Gas Light and Coke 83, 83⅛, 83¼, 3½ p.ct. 59½, 3 p.ct. debenture 58½, Hastings and St. Leonards 3½ p.ct. 69½, Hong Kong and China 20⅜, Hornsey, 3½ p.ct. 69½, Imperial Continental 115, 116, 117, 118, South Metropolitan 93, Southampton 78½, Tottenham "B" 89. Supplementary prices, Brighton and Hove 6 p.ct. "B" preference 102, Croydon 6 p.ct. debenture 98½, Gas Light and Coke 5 p.ct. debenture 99, Hornsey 4 p.ct. debenture 72½.

On Wednesday, Bournemouth 12½, British 101, Continental Union 26½, 27½, European 91s. 3d., 92s. 6d., 96s. 3d., Gas Light and Coke 83, 83½, 3½ p.ct. maximum 59½, 3 p.ct. debenture 58½, Imperial Continental 114, 115, South Metropolitan 93¼, 93¾, Southampton 79½, Swansea 7 p.ct. preference 102, Tottenham "B" 90. Supplementary prices, Gas Light and Coke 5 p.ct. debenture 99.

On Thursday, Alliance and Dublin 78½, Bournemouth 12⅛, "B" 12, Brighton and Hove 168½, Bristol 87½ *ex* div., Commercial 4 p.ct. 77⅞, 78½, 78¾, European 90s., Gas Light and Coke 83, 83¼, 4 p.ct. preference 76½, Hastings 5 p.ct. 90, 3½ p.ct. 69½, Imperial Continental 105, 108, 110, Oriental 98½, Primitiva 9s. 9d., South Metropolitan 93, 93½, 93⅝, Wandsworth "B" 105, Wimbledon 5 p.ct. 10, Epsom 5 p.ct. 107. Supplementary prices, British Norwich 3 p.ct. debentures 54, Crowborough 44½, Gas Light and Coke 5 p.ct. debenture 99, Horley Additional "B" 92, 92½, Oxford 5 p.ct. 125, Wandsworth 3½ p.ct. new 91.

On Friday, Bombay 20s. 7½d., 20s. 9d., Bournemouth 5 p.ct. 12½, 7 p.ct. maximum 12⅝, Cape Town 4½ p.ct. debenture 69½, Commercial 4 p.ct. 79, Croydon maximum dividend 81, 81½, European 95s., Gas Light and Coke 83, 83¼, 83½, 3½ p.ct. 58, 3 p.ct. debenture 58¼, Hastings and St. Leonards 3½ p.ct. 70⅜, 71, Hornsey 3½ p.ct. 70, Imperial Continental 110, 110½, 114, Primitiva 9s. 6d., 9s. 9d., Tottenham "B" 88½, 89, Wandsworth "A" 125, "C" 91. Supplementary prices, Brighton and Hove 6 p.ct. preference 103⅞, Cape Town 5 p.ct. debenture 69½, Gas Light and Coke 5 p.ct. debenture 99.

In Lombard Street money was plentiful and rates remained easy. Lenders again charged 3½ p.ct. for renewing old day-to-day loans, and at the end of the week balances were on offer at 3¼ p.ct. or less. The average rate of Treasury Bill allotment was £4 5s. 6·42d.

In the Foreign Exchange Market, the franc dominated the situation during the whole of the week, and widespread pessimism is expressed in the City regarding its ultimate fate. On Tuesday, the French exchange actually reached 240 to the £, the value being exactly one penny. However, after wild speculation and consequent fluctuations, there was a material improvement by the end of the week, and the rate finally closed at 206. The Belgian franc was 202, and the Italian lire 149½. Sterling on New York was slightly firmer, and finished at 4.86⅛.

Silver was quiet and steady, the price being unaltered at 29 1/16d. per oz. Gold showed no change at 84s. 10½d. per oz.

The Bank Rate is 5 p.ct., to which it was raised from 4 p.ct. on Dec. 3. Bankers' deposit rates are 3 p.ct. The deposit rates of the discount houses are 3 p.ct. at call and 3½ p.ct. at notice.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf. Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. July 23.	Rise or Fall on week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
171,978	Stk.	Feb. 4	5	5	Aldershot 5 p.c. max. C.	74—77	..	..
322,992	"	"	4	4	Do. 4 p.c. Pref.	67—72	..	..
1,551,868	"	Apl. 1	6½	6½	Alliance & Dublin Ord.	75—80	..	..
374,000	"	July 8	4	4	Do. 4 p.c. Deb.	60—65	..	78½—79½
300,000	1	May 6	1 7/8	1 7/8	Bombay, Ltd.	1 5/8—1 7/8	..	..
170,000	10	Mar. 4	8½	8½	Bournemouth 5 p.c.	12—13	..	20/7½—20/9
500,050	10	"	7	7	Do. B 7 p.c.	12—12½	..	12 5/8—12¾
275,000	10	"	6	6	Do. Pref. 6 p.c.	11—12	..	12—12 1/8
50,000	Stk.	June 24	3	3	Do. 3 p.c. Deb.	54—57	..	11½
162,025	"	"	4	4	Do. 4 p.c. Deb.	74—77	..	..
214,740	"	Mar. 18	12	12	Brighton & Hove Orig.	167—172	..	..
244,200	"	"	9	9	Do. A Ord.	128—133	..	168⅜
1,287,500	"	July 22	5	5	Bristol 5 p.c. max.	86—87a*	..	132—132½
855,000	"	Mar. 18	8	7	British Ord.	87—92	−1	87½
100,000	"	June 24	7	7	Do. 7 p.c. Pref.	99—104	..	101—102
130,000	"	"	4	4	Do. 4 p.c. Red. Deb.	114—119	..	..
100,000	10	June 10	6	8	Cape Town, Ltd.	68—73	..	..
100,000	10	Apl. 22	4½	4½	Do. 4½ p.c. Pref.	6½—7½	..	..
150,000	Stk.	June 24	4½	4½	Do. 4½ p.c. Deb.	5⅝—6⅝	..	..
696,860	"	July 22	6	6	Cardiff Con. Ord.	66—71	..	..
237,960	"	June 24	7½	7½	Do. 7½ p.c. Red. Deb.	94—97*	−2	69½
157,150	"	Mar. 4	5	6½	Chester 5 p.c. Ord.	98—101	..	..
79,185	1	Apl. 22	†2/-	†2/-	Colombo Ltd. Ord.	87½—92½b	..	..
24,495	1	"	1/4½	1/4½	Do. 7 p.c. Pref.	28/—30/-	..	..
1,513,280	Stk.	Mar. 4	5½	5½	Commercial 4 p.c. Cap.	20/—22/-	..	29/—29/6
560,000	"	"	5/3¾	5/3¾	Do. 3½ p.c. Cap.	77—80	..	20/9—21/3
475,000	"	June 24	3	3	Do 3 p.c. Deb.	77—80	..	77⅛—79
800,000	"	Oct. 8	—	—	Continental Union, Ltd.	54—57	..	..
200,000	"	Mar. 4	7	7	Do. 7 p.c. Pref.	25—30	..	..
737,150	"	Mar. 4	6½	6½	Croydon sliding scale	85—88	−1	26½—28
408,100	"	"	5	5	Do. max. div.	95—98	..	..
492,270	"	"	6	6	Derby Con.	79—82	..	..
55,000	"	Mar. 4	4	4	Do. Deb.	107—109c	..	81—81½
209,000	"	June 24	5	5	East Hull Ord. 5 p.c.	73—75c	..	..
50,000	"	Mar. 4	5	5	Eastbourne 5 p.c. Deb.	86—89	..	..
1,002,180	"	June 24	5	5	European, Ltd.	91—96	..	..
18,788,960	10	Apl. 1	†6	†6	Gas Light & Coke 4 p.c. Ord.	4—5	−⅛	..
2,600,000	Stk.	Feb. 18	5½	4/17/4	Do. 3½ p.c. max.	83—85	..	4⅛—5
4,157,020	"	"	3½	3½	Do. 4 p.c. Con. Pref.	58—61	..	83—83⅜
5,602,620	"	"	4	4	Do. 3 p.c. Con. Deb.	76—79	..	58—59⅛
181,315	"	June 24	3	3	Do. 6 p.c. Br'tf'd Rd. Db.	58—61	..	76—76½
180,000	"	"	—	—	Do. 10 p.c. Bonds.	100—105	..	58½—58⅝
42,000	"	—	10	10	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	"	—	7½	7½	Hastings & St L. 5 p.c. Conv	88—93	..	..
258,740	"	Mar. 18	6⅜	6⅜	Do. 3½ p.c. Conv.	68—73	..	90
70,000	"	"	5½	6½	Hongkong & China, Ltd.	19½—20½	..	69½—71
173,200	Stk.	June 10	†10	†10	Hornsey Con. 3½ p.c.	69—71	..	20⅜
1,976,000	"	Mar. 4	5	5	Imperial Continental Cap.	108—118	..	69¼—70
226,170	"	May 20	10	†10	Do. 3½ p.c. Red. Deb.	69—72	−½	105—120
235,242	"	Feb. 4	3½	3½	Lea Bridge 5 p.c. Ord.	95—100	..	..
2,127,840	"	Mar. 18	6½	6½	Liverpool 5 p.c. Ord.	80¾—81½b	..	..
600,000	"	Feb. 18	5½	5½	Do. 7 p.c. Red. Pref.	102¼—104½b	..	..
165,736	"	Mar. 18	7	7	Maidstone 5 p.c. Cap.	115—120	..	..
69,480	"	Feb. 18	9	8	Do. 3 p.c. Deb.	53—58	..	..
75,000	" 5	June 24	3	3	Malta & Mediterranean	5½—5⅝	..	..
541,920	Stk.	June 24	†6	†7	Montevideo, Ltd.	76—79	..	..
2,061,315	"	May 20	†4	†6	Newcastle & Gateshead Con.	70½—71½d	..	..
360,929	"	Mar. 4	5	5	Do. 4 p.c. Pref.	74½—75½d	..	..
529,705	"	"	4	4	Do. 3½ p.c. Deb.	68—69d	..	..
15,000	"	June 24	3½	3½	North Middlesex 10 p.c.	155—160	..	..
91,530	"	Mar. 4	11½	11½	Do. 7 p.c.	112—117	..	..
300,000	Stk.	May 6	8 3/10	8 3/10	Oriental, Ltd.	96—101	..	..
188,120	"	June 24	9	7	Plym'th & Ston'house 5 p.c.	108—113	..	98½
60,000	50	Mar. 4	7⅞	7⅞	Portsea Island B	90—95	..	..
100,000	50	"	14	14	Do. C	88—93	..	..
2,289,909	1	"	13	13	Primitiva Ord.	9/3—10/3	..	..
282,200	100	June 1	—	—	Do. 4 p.c. Red. Deb.	83—85	..	9/6—9/10½
600,000	Stk.	July 22	4	4	Do. 4 p.c. Red. Deb. 1911	65—67*	..	..
180,305	"	June 24	4	4	Do. B. Aires 4 p.c. Rd. Db.	65—67	−1	..
256,847	"	"	4	4	Do. R'r P'ts 4 p.c. Rd. Db.	65—67	..	..
150,000	10	Mar. 18	4	4	San Paulo 6 p.c. Pref.	7½—8½	..	..
125,000	50	July 1	6	6	Do. 5 p.c. Red. Deb.	44—47	..	..
270,000	Stk.	Mar. 18	6	6	Sheffield A	98—100e	..	..
419,968	"	"	5½	5½	Do. B	98—100e	..	..
1,047,000	"	"	5½	5½	Do. C	98—100e	..	..
90,000	"	"	5½	6	South African	5—7	..	..
6,509,895	10	June 11	4	—	South Met. Ord.	92¼—94½	..	..
1,986,445	Stk.	Mar. 4	5	7	Do. 3 p.c. Deb.	55—58*	..	93—93⅜
704,000	"	July 8	3	3	Do. 6½ p.c. Red. Db.	102—104	..	..
91,500	"	Mar. 4	6½	6½	South Shields Con.	117—119d	..	..
1,187,795	"	Mar. 4	8½	8½	South Suburban Ord. 5 p.c.	98—101	..	..
368,897	"	Mar. 4	6½	6½	Do. 5 p.c. Deb.	92—95	..	..
647,740	"	June 24	5	5	South'mpton Ord. 5 p.c.max.	77—80	..	..
121,275	"	Mar. 18	5	5	Do. 4 p.c. Deb.	68—73	..	..
250,000	"	June 24	4	4	Swansea 7 p.c. Red. Pref.	100—103	..	78½—79½
200,000	"	Mar. 4	7	7	Do. 6½ p.c. Red. Deb.	99—101	..	..
120,000	"	June 24	6½	6½	Tottenham District A 5 p.c.	105—110*	−3	102
882,375	"	July 22	7½	7½	Do. B 3½ p.c.	87—90*	−1	..
150,000	"	"	5½	6½	Do. 5½ p.c. Pref.	99—101*	−2	88½—90
181,255	"	"	5½	5½	Do. 4 p.c. Deb.	73—76	..	..
258,251	"	June 10	4	4	Tynemouth Con. and New	67½—68½d	..	..
"	"	Mar. 18	5	5	Uxbridge, Maidenhead, &	..	..	..
197,294	"	Mar. 4	6⅝	6⅝	Wycombe 5 p.c.	90—95	..	..
88,333	"	"	5	5	Do. 5 p.c. pref.	82—87	..	..
91,800	"	"	6⅝	6⅝	Do. 5 p.c. Maidenh'd	87—92	..	..
30,000	"	July 8	8½	8½	Wandsworth, Wimbledon, and Epsom—			
255,636	"	"	7	7	Wandsworth A 5 p.c.	122—127	..	..
412,450	"	"	5/19/0	5/19/0	Do. B 3½ p.c.	102—107	+2	125
352,000	"	"	6⅝	6⅝	Do. C and New	88—93	+2	105
98,000	"	"	7½	7½	Wimbledon 5 p.c.	98—103	+2	91
88,416	"	June 24	3	3	Epsom 5 p.c.	104—109	+2	101
					3 p.c. Deb.	54—57	..	107

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